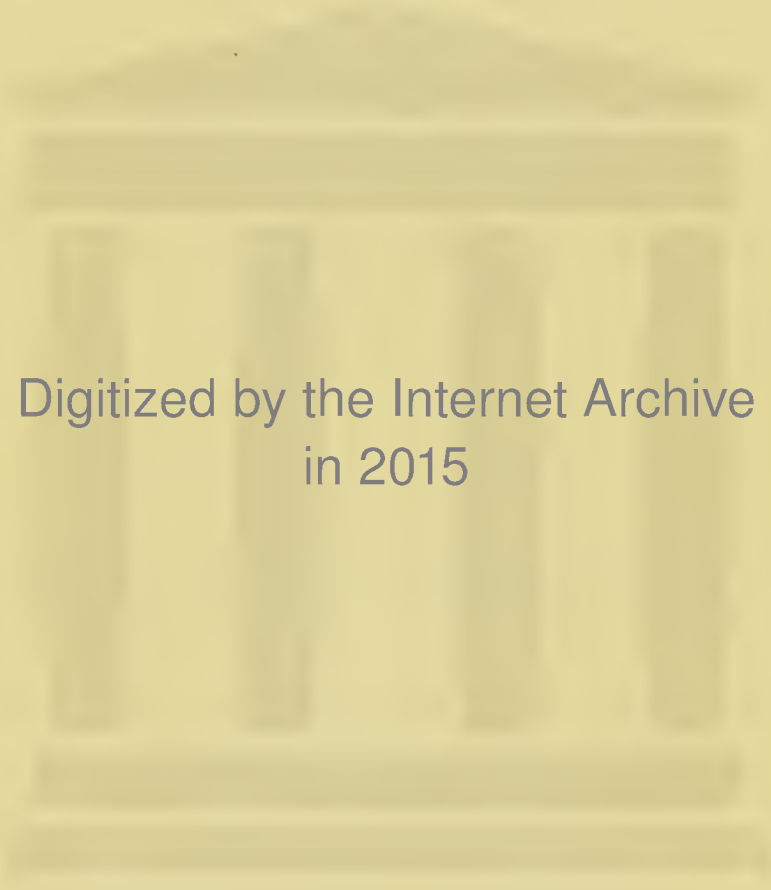

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DISSERTATION

ON THE

CHEMICAL & MEDICAL PROPERTIES

OF THE

BRISTOL HOTWELL WATER.

TO WHICH ARE ADDED

PRACTICAL OBSERVATIONS

ON THE

PREVENTION & TREATMENT

OF

PULMONARY CONSUMPTION.

By A. CARRICK, M. D.

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DISSERTATION

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BRISTOL HOTWELL WATER.

PART I.

The Chemical Properties of the Hotwell Water.

THE Analyſis of Mineral Waters is juſtly accounted one of the moſt difficult departments of Chemiſtry, and the extent of the difficulty can be underſtood by thoſe only who have made the attempt. Beſides a knowledge of the various chemical phænomena, a certain facility and neatneſs in conducting experiments to be acquired only

by practice, is indiſpenſibly neceſſary; together with unwearied perſeverance in repeating and varying the proceſſes, as they often afford at beſt only an approximation of the truth.

In conducting the following experiments, great regard was paid to accuracy, and much time beſtowed on them, which might perhaps have been better employed; but as they were chiefly undertaken as a chemical exerciſe, my pains have not been unrewarded: and, as no analyſis of theſe waters has been made public ſince the recent improvements in chemiſtry, the preſent may afford the reader ſome information as well as amuſement.

As a great deal muſt neceſſarily depend upon the purity of the Reagents in reſearches of this ſort, thoſe employed in the following analyſis were prepared either by Mr. Willis, of London, whoſe accuracy is ſufficiently known, or by myſelf. The articles found in the ſhops are totally inadmiſſible for ſuch purpoſes.

Where the heat of fire was required, a furnace after Dr. Blacks model, or that of Mr. Watt's Pneumatic Apparatus was employed, being a ſecurity from duſt and accidents.

The materials to be weighed, were always dried as nearly as poſſible to the ſame degree, by being placed for a certain time upon a tin plate heated by boiling water. The bits of paper uſed as filtres, and the cotton threads employed as ſyphons, were dried by the ſame means, and weighed previouſly to being uſed

The Balance for ſmall weights is perfectly ſenſible to the fiftieth part of a grain: That for large weights is readily turned by a grain, with four pounds in each ſcale.

The diſtilled water was prepared in glaſs retorts from ſnow water.

But in ſpite of every precaution, I am well aware that ſome inaccuracies may have taken

place; indeed the preſent ſtate of chemiſtry improved as it is, renders it unavoidable: but I truſt they are too inſignificant to affect the reſult in any ſenſible degree.

DESCRIPTION of the HOTWELL.

Previouſly to entering upon the analyſis of the water, it will be proper to give ſome deſcription of the fountain from whence it proceeds and the ground through which it flows.

The new Hotwell is ſituated at the bottom, and nearly at the Southern extremity of St. Vincent's Rock, on the Gloceſterſhire bank of the river Avon, and about a mile below the city of Briſtol.

Before it was incloſed in its preſent form, the ſpring iſſued from the ſloping bank about 26 feet below high water mark, and 10 or 12 above low water, and was received into one or more troughs or baſons for the purpoſe of bathing in, and waſhing of ſores, and of courſe was acceſſible only at low water.

About a century ago, it was ſurrounded with a caſe of maſon work, in order to defend it from the water of the river, and force it to riſe to the level of the beach: but it was found impoſſible when it had accumulated to a certain height to prevent it from eſcaping by ſome other outlet. The incloſure was therefore furniſhed with valves at bottom to prevent the influx of the river water, and allow an iſſue to the mineral water during the time of ebb. A pump is employed to raiſe the water for uſe, immediately as it iſſues from the rock, and the whole contrivance is found to anſwer perfectly well at all hours during the neap tides, but the water is ſaid to be rendered ſenſibly colder and ſomewhat turbid, at the equinoctial ſpring tides, when the river riſes to the height of 36 feet perpendicular. For this reaſon, the water is not drunk during the time of flood on thoſe days; but at low water it muſt be equally good as at any other ſeaſon.

The ſpring is extremely copious, diſcharging nearly forty gallons in the minute.

The water is inodorous, exceedingly limpid, ſparkling and pleaſant to the taſte, and when newly drawn numberleſs air bubbles are ſeen riſing to the ſurface, or adhering to the ſides of the glaſs.

The heat of the water as it iſſues from the pump, is 74 $\frac{1}{2}$ degrees of Fahrenheit, taking the average of ſeveral good Thermometers; and I have not obſerved the temperature to vary in any ſenſible degree at the higheſt ſpring tides, provided the pump had been previouſly kept working for ſome hours.

The ſpecific gravity of Hotwell water, is 1.00077.

The rock which riſes immediately behind the well to the height of 200 feet, conſiſts chiefly of ſtrata of very hard lime ſtone of various colours, interſected with numerous fiſſures in which are found abundance of Calcareous and Quartoſe Cryſtals, the latter known by the name of Briſtol diamonds.

Upon the ſurface of this calcareous rock there is found in moſt parts ſtrata, or maſſes of iron ore, a few feet in thickneſs, in ſome places tolerably pure, but generally combined with much quartoſe and micaceous matter, forming a ſtone uſed in building. Over all is a bed of ſtiff red clay, of unequal thickneſs.

Calamine, and ores of Lead, have been found on the neighbouring downs, and even on Clifton hill in ſmall quantities, and near the ſurface.

The ſtrata both of lime-ſtone and iron-ſtone, are inclined from north to ſouth, at an angle of about 50 degrees to the horizon.

The rocks on the oppoſite ſide of the river have nearly the ſame arrangement, and by the coincidence of their projections and depreſſions would ſeem to have been once continuous, and rent aſunder by ſome convulſion, whereby Clifton and Durdham down were ſeparated

from the correſponding elevated plain of Leigh-down, and a new outlet formed for the Avon. As, however, the oppoſing ſtrata do not correſpond with each other in thickneſs, and are both inclined in the ſame direction, it appears probable that the whole of the eaſtern bank has ſlid from off the weſtern, ſo that the lowermoſt ſtratum of the eaſtern bank, which is now buried in the earth, reſted originally on that which forms at preſent the uppermoſt ſtratum of the weſtern bank.

Nearly a mile below, and on the ſame ſide of the river, is the Old Hotwell, which with ſimilar general properties, differs a little from the new in temperature, being a few degrees colder; for which reaſon, and its greater diſtance, and difficulty of acceſs, it has of late years fallen into diſuſe. It riſes about 40 feet above the level of the new Hotwell ſpring, and is probably derived from the ſame ſource.

About three years ago the late Mr. Morgan

ſunk a well from the top of St. Vincent's rock ſome way to the eaſtward of the Hotwell, with a view of falling in with the ſpring, and after perforating to the depth of 240 feet, which is conſiderably below the level of the Hotwell, a plentiful vein of water was found which is now raiſed by means of a ſteam engine. Mr. Green, an intelligent and ingenious watch-maker, at the Hotwells, who went down when the water was firſt diſcovered, informed me that the ſtream iſſued from a fiſſure on the eaſt ſide of the rock, as aſcertained by the compaſs, and raiſed two thermometers, with which he was provided, to 66 degrees.

Several wells have been ſunk in different parts of Clifton-hill for the accommodation of private families. The water is found at various depths, from 160 to 60 feet, in proportion to the diſtance from the edge of the precipice. Near the foot of the hill, along the caſtern ſide, water is found very near the ſurface, and in one part iſſues ſpontaneouſly in a copious ſtream

called Jacob's well, which is partly conveyed in pipes to Briſtol. The water of all theſe ſprings is exceedingly good, and pleaſant to the palate; but neither warm nor ſparkling like the Hotwell water.

The reaſon of this difference, and the cauſe of heat in the Hotwell water, is not likely to admit of a ſatisfactory explanation.

That ſubterraneous fires impart heat to fountains in their vicinity, is evident from the hot ſprings in the neighbourhood of Hecla, Solfatara, and other volcanoes; but it does not neceſſarily follow, that ſuch fires muſt be the cauſe of heat in every thermal water. Various chemical combinations are attended with heat, and it is poſſible at leaſt, that the formation or decompoſition of ſome of the ingredients of this water, might impart the degree of heat it poſſeſſes. The vitriolic acid, for example, would produce heat in the formation of ſelenite with the lime-ſtone of the rock through which it paſſes, and detach

at the ſame time, the carbonic gas with which the water is impregnated. Various ſuppoſitions of this ſort might account for the phænomena; but ſuppoſitions, however plauſible, do not amount to proof, and it would reaſonably be objected, that the wells in the neighbourhood, although they contain ſelenite, and moſt of the other ingredients of the Hotwell water, in ſome degree, are not warm.

THE FOLLOWING

PRELIMINARY EXPERIMENTS

Were made in order to obtain ſome idea of the contents of the Hotwell Water.

Exp. 1. Infuſion of Litmus is rendered ſcarce perceptibly of a deeper blue.*

2. Infuſion of Brazil wood is ſcarce perceptibly altered towards a purple ſhade.

* In uſing theſe infuſions, or ſyrup of violets, equal quantities of the reagent is put into two ſimilar glaſſes; one of which is afterwards filled with diſtilled water, and the other with the mineral water; and in this way the ſmalleſt quantity of acid or alkaline matter becomes apparent. In making this experiment, the greateſt care is neceſſary to have the diſtilled water free from carbonic acid, as well as other impurities.

3. Paper ſtained with the above infuſions, or with turmeric, is not perceptibly altered.

4. Syrup of violets is rendered of a darker blue or dirty green.

The ſmalleſt quantity of an alkali, produces a very different and brighter green.

The tenth part of a grain of calcareous ſpar finely powdered, and ſuſpended in an ounce of diſtilled water, produces exactly the ſame ſhade, when mixed with the above-mentioned infuſions or ſyrup of violets.

5. Letters written with ſolution of acetated lead were not rendered viſible by being dipt in the water, or held over its ſteams when boiling.

6. Lime-water cauſes an inſtant precipitation.

7. As do the fixed and volatile alkalis.

8. Neither of the mineral acids occaſion any perceptible change.

9. Acid of ſugar cauſes a precipitation of ſaccharated lime, inſoluble in any acid.*

10. Muriated barytes occaſions an immediate precipitation, inſoluble in muriatic, or any acid.

11. Nitrated Silver cauſes an inſtant precipitation inſoluble in nitric, or any acid.

12. Pruſſian alkali cauſes no precipitation.

13. Nor does Tincture of Galls.

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* Although ſaccharated lime is not ſoluble in the ſtrongeſt acids, nor in pure water, a ſmall quantity of any of the mineral acids dropt upon it, and triturated with it, renders it eaſily ſoluble in a moderate quantity of water.

Many more experiments were made with other reagents; but theſe ſeem perfectly ſufficient to indicate the nature and contents of the water.

Experiments 1, 2, 3, and 4, indicate the preſence of ſome alkali, or earthy ſubſtance, uncombined with the mineral acids; but in very ſmall quantity.

Exp. 5, demonſtrates the abſence of hepatic gas.

Exp. 6, the preſence of carbonic acid gas.

Exp. 7, the preſence of ſome earthy ſalt.

Exp. 8, the abſence of barytes.

Exp. 9, the preſence of calcareous earth.

Exp. 10, of vitriolic acid.

Exp. 11, of muriatic acid.

Exp. 12, and 13, demonſtrate the abſence of iron.

EXPERI-

EXPERIMENTS

FOR ASCERTAINING

The GASEOUS FLUIDS with which the Water is impregnated.

VARIOUS methods of collecting the gaſſes of mineral waters have been deviſed, none of which, it muſt be confeſſed, is perfectly accurate.

A proceſs for this purpoſe is deſcribed in Bergman's analyſis of Seydſchutz water, and ſince improved and recommended by other writers; in which the air is received into an inverted jar full of warm water, placed over an aperture in the lid of the veſſel in which the water of the experiment is boiled; taking advantage of the property of water not readily

abſorbing the gaſſes, when heated above 120° of Fahrenheit.

But although the proceſs appears at firſt ſight very plauſible, I have found it after repeated trials, with inſtruments of various forms, always very unmanageable and uncertain, for reaſons which muſt indeed preſent themſelves upon a more attentive conſideration of the ſubject without making the experiment, and which I need not conſume time in pointing out. The indefatigable Swediſh chemiſt, ſenſible of theſe imperfections, was ſoon induced to abandon this method for another equally ſimple, and more accurate :—a retort with the neck bent at the extremity, ſo as to be introduced into an inverted receiver filled with mercury: But beſide the large quantity of atmoſpheric air which muſt neceſſarily be left in the neck and upper part of the retort, it will be found impoſſible to prevent the water from diſtilling over in conſiderable quantity and occupying part of the mercurial jar, and of courſe re-abſorbing a part

or perhaps the whole of the gas expelled from the retort, if the ebullition is continued a ſufficient length of time for the expulſion of the carbonic acid which adheres in part for ſeveral hours.

With a view of obviating this defect, I employed oil inſtead of mercury, which, owing to its leſs ſpecific gravity, would float upon the ſurface of the water as ſoon as the ſteam was condenſed into water: but I ſoon perceived that oil poſſeſſes a conſiderable diſpoſition for the abſorption of gaſses, and the experiment therefore could be of no avail.

In order to obviate, as far as poſſible, theſe inconveniences, I cauſed an alembic to be made, into which the end of a barometer tube was inſerted, being very accurately ground. The other end of the tube was bent nearly in the form of the letter *S*, for the purpoſe of being introduced under a mercurial receiver. The air contained in the tube of 36 inches in length, does not ex-

ceed a cubic inch, and as the alembic may be filled with the water, except only about a 25th part of its content, (equal to the expanſion of water when heated to the boiling point) the quantity of atmoſpheric air included in the whole apparatus may be very inconſiderable. The water being poured in, the tube inſerted, and the joining well ſecured by a proper luting, the alembic is placed upright in a ſand bath, and the bent end of the tube introduced into the inverted receiver. If the heat is applied gently and ſparingly, ſo that the ebullition ſhall be moderate and slow, very little ſteam paſſes over, being moſtly condenſed in the tube, through which it deſcends again into the alembic.

This ſuggeſted to me the idea of cauſing the tube to paſs through a refrigeratory, formed of a tin caniſter, about 18 inches long and 4 in diameter, filled with cold water, by the aſſiſtance of which the ſteam is ſtill more perfectly condenſed; yet when the ebullition is conti-

nued for ſome hours, a ſmall quantity of water always finds its way into the receiver, although not ſufficient to affect the experiment in any ſenſible degree.

The alembic with which I made this experiment was filled with the water at the pump-room and carefully corked, and conveyed home inverted, in order that none of the gas might eſcape or be extricated.

It contains exactly 10390 grains of Hotwell water at the temperature of 60° which is equal to 41.038 cubic inches, or 22oz. and 6 drachm meaſures very nearly.

Having poured out a certain meaſure of the water, which I knew from previous experiment to be equal to 510 grains, the tube was inſtantly inſerted, and the apparatus placed on the furnace as above deſcribed. It is to be obſerved, that the quantity of atmoſpheric air included in the apparatus was thus made to be very

exactly three cubic inches, the tube containing 250 grains of water, which joined to the 510 poured out of the alembic, make 760 grains, or 3 cubic inches of water. There remained in the alembic 9880 grains, which is equal to 39 cubic inches very nearly.

After a ſlow ebullition of three quarters of an hour, the apparatus was removed from the fire, as ſome drops of water began to be perceivable above the mercury, and it was found that 7.75 cubic inches of mercury was diſplaced, after the receiver had been cooled to the temperature of the room, which was about 60°.

But it is neceſſary to remark, that the volume of air in the mercurial receiver, is not the exact meaſure of the air expelled from the apparatus; as it muſt neceſſarily be in a leſs compreſſed ſtate than the air of the atmoſphere, owing to the column of mercury ſtill remaining in the receiver. For the denſity of the air

of the atmoſphere will be to the denſity of the air in the receiver, as the height of the mercury in the barometer at the time, is to that height *minus* the height of the column of mercury remaining in the receiver after the operation is finiſhed.

Therefore calling the denſity of the atmoſphere D and the denſity of the air in the receiver d, the height of the mercury in the barometer (which was at the time 29 inches) H, and the height of the mercury in the receiver (which was exactly 2 inches) h: Then D : d :: H : H—h Or D : d :: 29 : 27. Or, in other words, the volumes of air are in the inverſe ratio of their ſuperincumbent weight; and the real volume of the 7.75 cubic inches in the receiver, when reduced to the atmoſpheric denſity, is $\frac{7.75 \times 27}{29} = 7.215$ cubic inches. But as there was at the commencement of the operation 3 cubic inches of atmoſpheric air included in the apparatus, when this is ſub-

tracted from the air in the receiver, there remains only 4 . 215 cubic inches for the volume of gas expelled from the water by boiling.

After having carefully marked the height of the mercury in the receiver, some lime water was introduced in its place and agitated with the gas, the volume of which, after some hours standing, was found to be reduced to 3 . 5 cubic inches, which subtracted from 7.215 leaves 3 . 715 cubic inches for the volume absorbed by the lime water, or carbonic acid gas. The remaining 3 . 5 cubic inches I could not distinguish from atmospheric air by any means in my power. Of this 3 cubic inches was originally included in the apparatus; the remaining .5 must therefore have been extricated from the water.*

* To render this part of the experiment perfectly correct, a reduction of the volume of the 3 . 5 cubic inches ought to be made, on account of the column of water in the receiver, as was formerly done on account of the mercury; but the influence of 3 or 4 inches of water is too inconsiderable to render a calculation necessary.

According to this proceſs, a gallon of Hotwell water or 231 cubic inches, is impregnated with 22.003 cubic inches of carbonic acid gas, and 2.96 of reſpirable air, making together 24.96, or 25 cubic inches very nearly.

The ingenious Dr. Gioanetti of Turin, in analyſing the waters of St. Vincenzo, endeavoured to aſcertain the quantity of carbonic gas upon principles entirely different from the foregoing; calculating from the weight of the chalk which it precipitates from lime water.

By this means the quantity of carbonic acid in any water can be eſtimated, with very little trouble or expence, provided the experiments made to aſcertain the relative quantities of earth and acid in chalk, are accurate; and provided the ſame proportions obtain in natural and artificial chalk.

Unfortunately ſome difference takes place between the eſtimates of Bergman and Jacquin

on this ſubject; a hundred grains of chalk containing 34 grains of acid, according to the former, and 40 according to the latter, which leaves the matter in ſome uncertainty. But if a choice is to be made, I am inclined to rely upon the known accuracy of the Swediſh chemiſt.

From a gallon of Hotwell water ſaturated with lime water* I obtained 43.63 grains of precipitate: but as a part of this might proceed from the decompoſition of the muriated magneſia, with which we ſhall afterwards find the water to be impregnated, I ſaturated likewiſe a gallon which had been boiled for two hours in an open veſſel and filtred, and from this I obtained 4.8 grains of precipitate, moſt of which diſſolved readily in vitriolic acid. When

* This is moſt conveniently done by pouring a certain quantity of lime water into a large bottle, the content of which is previouſly aſcertained with accuracy, and afterwards filling it up with the Mineral water as it runs from the pump.

this is ſubtracted from the 43.63 grains of the former experiment, it leaves 38.83 grains for the chalk precipitated by the carbonic acid of the water; which, according to Bergman's calculation, muſt have been 13.19 grains by weight.

Taking then, with Lavoiſier, .44 grain for the weight of a cubic inch of carbonic gas, the volume of that gas contained in a gallon of the water would amonnt to 29.97 cubic inches.

This is conſiderably more than the quantity actually obtained in a gaſeous form by the former experiment; but this difference is not difficult to account for, when we conſider that the ebullition could not be continued a ſufficient length of time for the expulſion of all the carbonic gas, which adheres after many hours boiling. This experiment therefore I conſider more deciſive with regard to the carbonic acid; but as the atmoſpheric and other gaſſes adhere but ſlightly, they can be accurately obtained

by the former experiment; and both together cannot fail to come very near the truth. We may therefore eſtimate the gaſſes with which a gallon of Hotwell-water of 231 cubic inches is impregnated, as follows:

Carbonic acid gas	30	cub. inches.
Reſpirable air, ...	3	ditto.
Total, ...	33	

EXPERIMENTS

TO ASCERTAIN

The Quantity of SALINE and EARTHY MATTER in the Hotwell-Water.

Exp. 1. A Wine gallon of 231 cubic inches, or 58528 grains,* was ſlowly evaporated to dryneſs, in a cylindrical glaſs veſſel, about 5 inches in diameter, and 8 deep, incloſed in a tin caſe, and heated by boiling water.

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* I experienced ſome difficulty in obtaining the exact meaſure of a gallon, the ordinary pint meaſures not being ſufficiently accurate for chemical purpoſes. I was allowed acceſs to the ſtandard meaſures preſerved in the Guildhall of Briſtol; but I found it impoſſible to fill any wide-mouthed veſſel equally at different times. I therefore reſolved to weigh the ſubject of the preſent experiment; taking, with Mr. Everard, 58483.4 grains as the weight of a gallon of diſtilled water, at the temperature of 55 degrees: and I found that an equal volume of Hotwell-water at the ſame temperature, weighed exactly 58528.7 grains, being 45.3 grains in the gallon, heavier than diſtilled water.

No perceptible odor aroſe from the water during the proceſs.

A white ring like a thread was formed round the higheſt part of the veſſel to which the water had reached, and a thin grey ſcurf covered the ſides, to which it adhered very tenaciouſly when newly taken from the fire. The bottom of the veſſel was covered with imperfect and confuſed cryſtallizations reſembling flakes of ſnow, which adhered but ſlightly. The whole collected together formed a greyiſh powder, weighing 47.$\frac{3}{4}$ grains, which became moiſt by expoſure to the air for ſome days, and increaſed in weight 6 grains.

2. This reſiduum was digeſted for ſome hours in three drachms of alkohol, which was afterwards carried off by means of a cotton thread, uſed as a ſyphon.* The operation

* I at firſt made uſe of bits of filtering paper for theſe purpoſes, but I found the thread ſyphons greatly preferable; the minute earthy particles frequently paſſing through the pores

was repeated a ſecond time with a ſmaller quantity of alkohol, and the reſiduum, when dried, was found reduced to $38\frac{1}{2}$ grains, the alkohol having diſſolved $9\frac{1}{4}$ grains.

3. The $38\frac{1}{2}$ grains inſoluble in ſpirit of wine was digeſted ſome hours in half an ounce of cold diſtilled water, which was drawn off as in laſt exp. by the thread ſyphon. Small quantities of water were afterwards uſed to waſh the reſiduum, which when dried, was found reduced to $24\frac{1}{4}$ grains.

4. The $24\frac{1}{4}$ grains of laſt exp. was boiled for half an hour in a quart of diſtilled water, and only $13\frac{1}{2}$ grains remained undiſſolved.—This was a grey or aſh coloured powder, perfectly inſipid, and which attracted no humidity nor weight from the atmoſphere.

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of the paper in ſpite of the greateſt care. Beſides a portion of the earthy matter always adheres to the paper notwithſtanding every precaution, but none to the ſyphon if attentively managed.

We have thus out of $47\frac{3}{4}$ grains of reſiduum, $9\frac{1}{2}$ grains ſoluble in alkohol, 14 ſoluble in a ſmall quantity of cold water, $10\frac{3}{4}$ ſoluble in 600 times its weight of boiling water, and $13\frac{1}{2}$ inſoluble in either of theſe menſtrua.

In the ſpirituous ſolution we are to expect calcareous or magneſian muriates, or perhaps nitrates, according to Bergman ;* in the ſolution by cold water, a mixture of various neutral ſalts; particularly vitriolated ſoda, or Glauber's ſalt, muriated ſoda, or common ſalt, and vitriolated magneſia or Epſom ſalt; in the ſolution made by boiling water, we are to look for vitriolated lime, or ſelenite, alone; and in the inſoluble reſidue, for carbonated lime and magneſia, and perhaps quartz; it being evident from the preliminary experiments, from the appearance of the reſiduum or of the water itſelf, and from an inſpection of the gutters in which it runs,

* Nitrous ſalts very rarely occur in waters: and I believe never but in ſtagnant waters, or wells in the vicinity of marſhes.

that neither iron clay nor barytes exiſt in the water.

5. Upon one half the reſidue inſoluble in boiling water, diſtilled vinegar was gradually poured, which diſſolved it entirely, with effervescence, and extrication of carbonic gas. The ſolution when diluted with water, was quite tranſparent.

Hence it is evident that neither ſilicious earth, nor clay in an uncombined ſtate, is held ſuſpended in the water; the firſt being perfectly inſoluble in acetous acid, and the latter very nearly ſo. But this proof of the abſence of clay is not neceſſary; for water in which clay in an uncombined ſtate, is ſuſpended, is always more or leſs of an opal colour; whereas this is perfectly limpid.

6. Part of the acetous ſolution gave a copious precipitate to acid of ſugar.

The remainder, by ſlow evaporation to dryneſs, was converted into a filamentous, moſslike ſubſtance, which did not in any degree deliqueſce in a moiſt atmoſphere.

Hence it appears that the reſidue under examination is carbonated lime only, without any mixture of magneſia: For acetated lime remains permanently dry; but acetated magneſia is very deliqueſcent.*

7. To render this concluſion more deciſive, the remaining half of the $13\frac{1}{2}$ grains of exp. 4 was cautiouſly ſaturated with dilute vitriolic acid, ſome drops of a blue infuſion being added to mark exactly the point of ſaturation. Upon afterwards pouring in ſome diſtilled water, a white powder remained at the bottom of the glaſs, and the water, when decanted off, was perfectly inſipid, poſſeſſing none of the bitterneſs of Epſom ſalts.

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* Vide Bergman's analyſis of waters.

8. To this water a quantity of lime water was added which occaſioned no precipitation of magneſia; but remained quite tranſparent.

This experiment I have many times repeated with the ſame reſult; but on one occaſion I was a good deal ſurpriſed to obſerve ſome very thin and minute flakes of magneſia precipitated by lime water, which made me doubt the accuracy of my former obſervations. This I afterwards diſcovered to be owing to the china baſon in which the water was evaporated having been ſuffered, by accident, to remain too long on the ſand bath, whereby part of the muriated magneſia was decompoſed. By repeating the proceſs, I was ſatisfied of the fact, and in order ſtill more clearly to aſcertain the preſence or abſence of carbonated magneſia in the water, I made the experiment in the following way.

9. A quart of Hotwell water was evaporated to about one fourth. By filtration 2 grains of a white powder was obtained, which was after-

wards ſaturated with vitriolic acid. The earthy ſalt was waſhed with diſtilled water, which was carefully decanted off and poured into a phial along with a ſufficient quantity of lime water, and no cloudineſs nor precipitation whatſoever was produced, after many days ſtanding.

From theſe experiments we are warranted to conclude, that the reſidue inſoluble in boiling water is carbonated lime only, and that no carbonated magneſia exiſts in the Hotwell water.

10. The alkohol of exp. 2, which diſſolved $9\frac{1}{2}$ grains, was evaporated by a gentle heat, and a ſubſtance was obtained in appearance like manna, very hot and pungent to the taſte, and extremely deliqueſcent.

This was divided into three equal parts.

11. One of theſe diſſolved in diſtilled water did not alter the infuſion of brazil wood; gave

no precipitate to acid of ſugar: nor to muriated barytes.

Hence it is proved to contain no calcareous earth, nor any ſort of vitriolic ſalt; which laſt, indeed, are not ſoluble in ſpirit of wine.

12. Another portion was perfectly diſſolved in a ſmall quantity of dilute vitriolic acid, with extrication of the well known white and acrid vapors of marine acid.

13. The vitriolic ſolution, upon the addition of mild vegetable alkali depoſited a ſmall flaky precipitate which weighed nearly half a grain, and was readily re-diſſolved in vitriolic acid, and acquired the bitter taſte of Epſom ſalt.

From theſe experiments I was led at firſt to conclude, according to Bergman, that the $9\frac{1}{2}$ grains diſſolved by the alkohol in exp. 2, was muriated magneſia alone; but the remaining portion, which was left in a glaſs and had deli-

queſced during the night, was placed near a window expoſed to the ſun's rays, where it remained neglected for ſeveral days. Upon again attending to it I obſerved ſeveral cubical cryſtals which I ſeparated from the ſurrounding liquor with the point of a knife, and found them on examination by the taſte, the microſcope, and different teſts, to be very pure cryſtals of common ſalt.

14. By repeating the experiment upon the whole quantity of ſaline matter obtained by alkohol from the reſiduum of another gallon of water, I collected $2\frac{1}{4}$ grains of common ſalt in cryſtals, and thus it appears that the muriate of magneſia contained in a gallon of Hotwell water is only $7.\frac{1}{4}$ grains.*

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* That alkohol is capable of diſſolving a portion of common ſalt is not, I believe, generally ſuppoſed. I have made the experiment on perfectly pure common ſalt, with the beſt alkohol I could make or procure, and have always obtained cubes of common ſalt by evaporating the ſpirit; altho' I am not yet perfectly certain in what proportion.

15. The $7\frac{1}{4}$ grains which remained after all the cubes of common ſalt had been removed, was diluted with water, and ſome nitrated ſilver dropt in at different times, as long as any precipitate continued to fall. The precipitate was waſhed with a ſmall quantity of nitric acid, and afterwards with diſtilled water ſeveral times, and the Luna cornea when dried was found to weigh 6.35 grains.

16. The water of Exp. 3 ſlowly evaporated to dryneſs afforded very exactly 14 grains of irregular cryſtals, which attracted a ſmall quantity of moiſture from the atmoſphere of a damp room.

This ſalt was divided into four equal parts.

17. A bit of one of thoſe put upon a red hot iron, did not explode nor ſenſibly decrepitate, but after becoming liquid was converted into a whitiſh maſs, after the manner of Glauber's ſalt,

which this ſalt likewiſe reſembles in taſte. The taſte is diſtinctly different from that of vitriolated tartar, or common marine ſalt.

The remainder of this portion was ſaturated by the help of a blue infuſion, with vitriolic acid, of which a very ſmall quantity only was requiſite. The fumes of muriatic acid were extricated, and the taſte of Glauber's ſalt became more diſtinct.

18. Upon another portion of this ſalt ſome diſtilled water was poured, in order to diſſolve it; but I found that a ſmall quantity of white matter remained at the bottom undiſſolved after frequent agitation, and the application of heat; which, upon decanting the ſolution, was found to weigh about the eighth of a grain. This operation I have ſince often repeated upon the ſalts obtained from the water at other times: I find the whole quantity obtainable from a gallon, in this way, to be rather more than half a grain.

It neither effervefces with, nor is ſoluble in acids, and is undoubtedly nothing but ſelenite. But why it ſhould have been more readily ſoluble in Exp. 3 by an equal quantity of water, than now, I cannot eaſily explain.

19. Into the filtred ſolution of laſt Exp. ſome cryſtals of ſaccharine acid were put, which occaſioned a ſmall precipitation of ſaccharated lime that weighed one-eighth of a grain nearly.* This quantity has not varied perceptibly in the different trials I have made, and it can only ariſe from a portion of ſelenite diſſolved along with the ſalt. But as the proportion of calcareous earth in ſelenite and in ſaccharated lime is nearly the ſame, we may conclude from this and the foregoing Exp. that about one grain of ſelenite is contained in the 14 grains of ſalt under examination.

* I have repeatedly convinced myſelf by experiments on Epſom ſalt and muriated magneſia, that ſaccharine acid does not precipitate the magneſia from them, as has been alledged by ſome.

20. The filtred ſolution of this portion of the ſalts, from which the ſelenite had thus been ſeparated, was mixed with a ſolution of alkali of potaſh, and heated to the boiling point; but no precipitation was perceivable after ſeveral hours ſtanding; a proof of the abſence of Epſom ſalt or magneſia in any form, as well as of earth of allum. But as it was rendered probable by the foregoing experiments that ſome vitriolic ſalt exiſted in the compound under examination.

21. Another portion of Exp. 16, from which the ſelenite had been ſeparated by acid of ſugar as above, and diſſolved in half an ounce of diſtilled water, had a few drops of pure muriatic acid dropt into it*. Muriated barytes

* The muriatic acid was added here, in order to prevent the barytes from being precipitated by any uncombined alkaline ſalt that might poſſibly exiſt in the ſolution: But this precaution was probably unneceſſary, as the ſalts neither alters the colour of Turmeric paper, nor infuſion of Brazil wood; a ſufficient proof that no alkaline matter is preſent; nor is any alkali obtained by waſhing with diſtilled vinegar.

was then added, which inſtantly cauſed a copious precipitation of terra ponderoſa, weighing, when waſhed repeatedly with diſtilled water, and dried, 4.75 grains; which is at the rate of 19. from the 13 grains of ſalt under examination, when ſeparated from the grain of ſelenite they have been ſhewn to contain.

From the taſte, appearance, and habits of theſe ſalts, from the rareneſs of vitriolated tartar in mineral waters, from the evidence of Exp. 20, which proves the abſence of Epſom ſalt, it becomes almoſt perfectly certain that the vitriolic acid detected in this experiment, is furniſhed from vitriolated ſoda, or Glauber's ſalt. In order, therefore, to aſcertain the quantity or relative proportion of the Glauber's ſalt, I made the following Exp. ſuggeſted by Dr. Black in his incomparable analyſis of the Iceland waters, from which I have greatly borrowed.

22. Ten grains of Glauber's ſalt that had ſpontaneouſly efflooreſced into a fine white pow-

der, was diſſolved in diſtilled water. Some infuſion of Brazil-wood was added, to ſee whether the ſalt was perfectly neutral, and a few drops of muriatic acid afterwards poured in, as in laſt Exp. Muriated barytes was then added to ſaturation, and 16.9 grains of terra ponderoſa was obtained.

According to this experiment, a gallon of Hotwell water contains 11.24 grains of Glauber's ſalt.

23. As it appeared from Exp. 18, that a muriatic ſalt exiſted in the mixed ſalt under examination, the remaining portion was diſſolved in diſtilled water, to which a few drops of nitric acid, perfectly pure, was added. Nitrated ſilver was then poured in, to ſaturation, and 1.1 grains of luna cornea was precipitated; which is at the rate of 4. 4 from the 13 grains.*

* It may be ſuſpected that the vitriolic acid of the Glauber's ſalt contained in this portion might precipitate part of the ſilver; but I have repeatedly aſcertained the

From an attentive conſideration of the preceding experiments, it appears impoſſible that the muriatic acid thus detected ſhould proceed from any thing but muriated ſoda or common ſalt. To aſcertain the quantity of this ſalt in the water, I therefore made the following experiment:

24. Ten grains of common ſalt that had been purified by repeated cryſtallization, and perfectly dry, yielded 24 grains of luna cornea by ſaturation with nitrated silver.

The common ſalt therefore in a gallon of this water, (including the 2.25 grains of Exp. 14), is 4.05 grains: and the 14 grains diſſolved by the cold water in Exp. 3, conſiſts of

Selenite	1 grain
Glauber's Salt .	11.24
Common Salt .	1.8
	14.04

contrary, by experiments made with a much larger proportion of Glauber's ſalt to the water. The ſame obſervation is made by Dr. Black.——Analyſis of the Iceland Waters.

There remains to be examined, the contents of the water of Exp. 4, which diſſolved $10\frac{3}{4}$ grains of the reſiduum.

25. This being evaporated to dryneſs, a thin cruſt adhered to the ſides of the veſſel, and ſhining ſtellated cryſtallizations covered the bottom, as in Exp. 1, which, when collected together, was found to weigh $10\frac{1}{2}$ grains. The remaining $\frac{1}{4}$ grain having been loſt in the operation.

This ſubſtance was perfectly inſipid, attracted no humidity from the atmoſphere, and gave no tinge to infuſion of Brazil wood.

From theſe characters and the foregoing experiments this ſhould be ſelenite; but in order to ſee whether any carbonated lime or magneſia was taken up by the boiling water,

26. Upon the $10\frac{1}{2}$ grains ſome drops of muriatic acid were let fall, but no effervescence

nor extrication of gas took place. Some diſtilled water was then added, which was afterwards carried off by a cotton thread, and the powder was found reduced to nine grains.

27. This liquor was divided into two equal parts. One was mixed with lime water; but no depoſition of magneſia took place.

28. The other portion was evaporated to dryneſs, and yielded $\frac{3}{4}$ of a grain of a white powder, that ſhewed no diſpoſition to deliqueſce, which it muſt have done if it had been muriated lime: neither did it diſſolve in a ſmall quantity of muriatic acid, although it was thereby rendered miſcible with water; and any acid, even the vitriolic acid produces the ſame effect. This I found to be a property of ſelenite as well as of ſaccharated lime; but I was at firſt a good deal puzzled with the phœnomenon.

According to the foregoing experiments, a wine gallon of 231 cubic inches of Hotwell

water, is impregnated with

Muriated Magnefia	$7\frac{1}{4}$ grains
Muriated Soda	4
Vitriolated Soda	$11\frac{1}{4}$
Vitriolated Lime	$11\frac{3}{4}$
Carbonated Lime	$13\frac{1}{2}$
Making together of folid matter,	$47\frac{3}{4}$ grains

Carbonic acid gas	30 cubic inches
Refpirable air	3
Making together of gafeous fluids.	33 cubic inches.

The following Experiments were made as a check upon the foregoing conclufions.

29. A gallon of Hotwell water was faturated with nitrated filver, (fome nitric acid having been previoufly mixed with the water in order to prevent the precipitation of the filver by the calcareous earth), and 16 grains of luna cornea was collected.

It will be remembered we formerly obtained 6.35 grains of luna cornea from the muriated magneſia of Exp. 14; 5.4 grains from the $2\frac{1}{4}$ grains of common ſalt of the ſame Exp. and 4.4 from the common ſalt of Exp. 24: which added together make 16.3 grains of luna cornea, which is tolerably near.

30. A gallon of Hotwell water, into which ſome muriatic acid had been previouſly poured, was ſaturated with muriated barytes, and 37.8 grains of terra ponderoſa was collected.

We formerly obtained 19 grains of terra ponderoſa from the Glauber's ſalt of Exp. 3; but 18.8 grains is ſtill wanting, which was no doubt furniſhed in laſt Exp. by the ſelenite diſſolved in the water, which we have found to be $11\frac{3}{4}$ grains. In order, therefore, to determine the relative quantity of vitriolic acid furniſhed by the ſelenite,

31. I diſſolved 10 grains of native ſelenite

finely triturated, by boiling it for ſome minutes in 600 times its weight of diſtilled water. I afterwards ſaturated the liquor with muriated barytes; and 16.5 grains of terra ponderoſa was obtained. Conſequently, 19.38 grains of terra ponderoſa is obtainable from the $11\frac{3}{4}$ grains of ſelenite contained in a gallon of the water; which added to the 19 grains already ſtated to have been got from the Glauber's ſalts, makes 38.38 grains of terra ponderoſa from the reſiduum, which is about half a grain more than was obtained from the water.

The ſmall exceſs of this, as well as of the luna cornea, is eaſily accounted for by the more concentrated ſtate of the muriatic and vitriolic ſalts, whereby the precipitants more readily act on them.

32. Apprehenſive leaſt the ſaline ingredients had ſuffered ſome decompoſition by the heat employed for the evaporation of the water, I evaporated a gallon by the heat of the ſun, and

action of the air alone, by placing the china dish which contained it close to the window of a room facing the south. The evaporation was completed in the course of four or five weeks, and as the room was kept shut during the time, very little dust could have got in. The residuum did not adhere so tenaciously to the sides of the vessel, as when the evaporation is performed by artificial heat; but when dried to the same degree, it was found to weigh 48 grains, which is not materially different; and I obtained the very same result, by subjecting it to the analysis above recited.

33. I next attempted to prove the accuracy of the analysis by synthesis. But here I could not succeed completely, being obliged to employ a much larger quantity of carbonic acid for the suspension of the carbonated lime, than is found in the natural water.

Having first dissolved the selenite by boiling it for some time with the distilled water, I impreg-

nated the water, when cold, with a quantity of carbonic gas, ſufficient for the ſolution of the chalk, and then added the other ingredients. This artificial water taſted acidulous until expoſed for ſome time to the atmoſphere, whereby the carbonic acid was diſſipated, and ſome of the chalk precipitated. Of a water ſo ſlightly impregnated with ſapid matter, we cannot judge by the taſte; but I was pleaſed to find the analyſis of this compound deviate but ſlightly from that of the natural water, and I extracted very nearly the ſame quantities of the different ingredients I had mixed together.

34. I thus ſatisfied myſelf that no decompoſition of the ingredients is occaſioned by heat, neither in the natural nor artificial water; but I was ſtill at a loſs to account for the ſuſpenſion of $13\frac{1}{2}$ grains of carbonated lime, in water impregnated with no more than 30 cubic inches of carbonic gas, which would hardly ſuffice for the ſuſpenſion of half that quantity; and I could not help ſuſpecting that ſome decompo-

ſition of the original ingredients had taken place, owing to the approximation of their particles in conſequence of the evaporation of the menſtruum.

The ſuperabundant quantity of carbonated lime which is found in many mineral waters, is generally ſaid by chemical writers, to be ſuſpended mechanically; or, in other words, the particles are ſuppoſed to be ſo extremely minute, and their ſurfaces ſo greatly extended, that the reſiſtance of the water prevents their deſcent. This explanation is not altogether ſatisfactory in theory, nor can it be reduced to practice by human art. Nature however may poſſeſs means of accompliſhing this which we are unacquainted with, and there are ſome analogies in favor of the ſuppoſition :* But to me it appears more probable, that part at leaſt,

* Dr. Black in his analyſis of the Iceland Waters obſerves, that when ſilicious earth is ſuſpended in water by previous combination with an alkaline ſalt, the alkali may be detached, without precipitating the ſilicious earth.

of this carbonated lime is ſuſpended in the water by other means; or rather, that it exiſted in the water in another form and combination.†

It was formerly obſerved, that the water of the Hotwell was ſuppoſed to be tainted in ſome degree, by the river water, at ſpring tide. Finding that the temperature did not ſenſibly vary at thoſe times, I was at firſt inclined to ſuſpect the accuracy of the obſervation; but I was afterwards fully convinced, by the increaſed weight of the reſiduum obtained by evaporating the water, as will appear by the following table, exhibiting the quantity obtained from the water at different ſtates of the tide.

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† Since theſe ſheets were ſent to the preſs, I have begun a ſeries of Experiments on this ſubject, which, ſo far as they go, appear to countenance the theory of a decompoſition; but they are neither ſufficiently numerous nor deciſive, at preſent, to merit a recital.

Weight of reſiduum from a gallon taken at NEAP TIDE and LOW WATER:

5th Feb. 1797,	47. 5 grains
19th ditto	47. 75
22d March	47. 75
4th May	47. 75
2d June	47. 75
19th ditto evaporated by the Sun's heat	48.
Avarage	47. 75

Weight of reſiduum from a gallon taken at SPRING TIDE and HIGH WATER.

14th Jan. 1797	51. 5 grains
27th Feb.	51. 75
15th March	51. 75
24th June	51. 75
26th July evaporated by the Sun's heat	50. 5
Avarage	51. 2

The difference, which on the avarage is 3.45 grains, appears to be more or leſs conſiderable, according to the height of the tides, being greateſt about the equinox, when the ſpring tides are higheſt, and when of courſe the greateſt immiſſion of the river water may be ſuppoſed to take place. On this account, one would naturally expect the additional weight of the reſiduum to be made up chiefly of ſea ſalt, derived from the brackiſh water of the river; but this conjecture did not appear to be verified by the analyſis, the moſt perceptible increaſe being in the vitriolated ſoda and carbonated lime. Perfect accuracy in ſuch caſes, is not eaſily attained; but this at leaſt is certain, that when the water is wanted in its utmoſt purity, whether for the purpoſe of analyſis or medicine, it muſt not be taken during the flow of the tide, particularly about the full and change of the moon.

Before I quit the ſubject of analyſis, it will be expected I ſhould take ſome notice of the

Warm Spring lately diſcovered at Clifton. As this water is found in the immediate vicinity of the Hotwell-Spring, and does not materially differ in external characters, the preſumption in favor of its being derived from the ſame ſource, is certainly ſtrong; and it was not without ſome ſurprize, I found any ſenſible difference by analyſis. I have examined it repeatedly by the proceſſes above deſcribed, and likewiſe by a more particular comparative analyſis with the Hotwell-Water; and although I have not diſcovered any ingredient in the one, which does not likewiſe exiſt in the other, the difference in the proportions of ſome of them is ſufficiently ſtriking.

The temperature of this water is about 70 degrees. Its ſpecific gravity is 1.0008. The ſame appearances were produced by mixing theſe waters with the different reagents; except that a ſlightly deeper tinge was communicated to infuſion of Brazil-wood and ſyrup of violets, by the water of Sion-ſpring.*

* Vide Preliminary Experiments.

	Hotwell	*Sion Spring*
From a gallon of the waters, ſaturated with lime-water, I obtained a precipitate which weighed	Grains. 43.63	Grains. 34.5
From a gallon that had been previouſly boiled, ſaturated with lime-water . . .	4.8	4.5
From a gallon ſaturated with acid of ſugar	25.6	32.
From a gallon ſaturated with muriated barytes	37.33	45.
From a gallon ſaturated with nitrated ſilver	16.	15.25
From a gallon evaporated to dryneſs, I obtained a reſiduum which weighed ..	47.75	51.
By the foregoing analyſis, this was found to conſiſt of		
Muriated Magneſia	7.25	6.5.
Muriated Soda	4.	3.75
Vitriolated Soda	11.25	8.87
Vitriolated Lime	11.75	18.5
Carbonated Lime	13.5	13.
A gallon of the waters is likewiſe impregnated with	Cub. In.	Cub. In.
Carbonic acid gas	30	23.18
Atmoſpheric air	3	3.

The principal difference in the contents of the two waters, conſiſts in the greater quantity of vitriolated lime, and ſmaller quantity of carbonic gas, in the water of Sion-Spring. The proportion of the other ingredients is likewiſe ſomewhat ſmaller, but in theſe the difference is leſs conſiderable.

The ſmaller volume of carbonic gas may not improbably be owing to the accumulation of the water in the bottom of the well; whereby a large ſurface being expoſed to the atmoſphere, part of the ſuperabundant gas muſt neceſſarily eſcape.

It ſeems much more difficult to account for the different proportion of ſelenite, which in the water of Sion-Spring is ſo conſiderably greater. Is it owing to the action of the atmoſphere, or of ſulphuric vapors on the calcareous ſides of the ſhaft, whereby particles of the newly perforated lime ſtone are corroded, and waſhed down by the oozing of water

through the fiſſures of the rock, or the condenſation of moiſture on its ſurface? May it be expected to become leſs impregnated with this adventitious matter, when time has cruſted over the ſhaft in the manner of natural caves and ancient vaults and wells, whereby a defence would be formed againſt the action of the atmoſphere, and perhaps, the oozing of extraneous moiſture prevented?

The reader will recollect that the heat of this water was found by Mr. Green to be 66 degrees only; whereas I have ſtated it at 70, which I have aſcertained to be its actual temperature, ſince part of theſe ſheets were printed off. This ſeeming contradiction is eaſily explained. At the time of Mr. Green's obſervation, the ſpring was remarkably ſcanty, and only trickled down the ſides of the ſhaft; but ſoon afterwards it became extremely copious, ſuddenly filling the well to the depth of many feet, which renders it probable that another vein of water, of the above temperature, had burſt into the ſhaft.

PART II.

MEDICAL PROPERTIES

OF THE

HOTWELL-WATER.

These, in a general point of view, will be ſufficiently obvious to the Medical practitioner, from the foregoing analyſis: but as this publication is more likely to fall into the hands of another deſcription of readers, ſome illuſtration muſt be acceptable to them.

The ſenſible effects of this water when taken into the ſtomach, are commonly ſaid to be a pleaſant ſenſe of warmth in that organ, with increaſe of ſtrength and vivacity; ſometimes however, it is reported to cauſe a diſagreeable ſenſation of weight in the ſtomach,

accompanied at firſt with ſlight tranſitory vertigo ; but in general, it is accounted an exeeption to other warm waters, in being neither ungrateful to the ſtomach nor taſte. It is hardly neceſſary to obſerve, that its effects, for very obvious reaſons, are moſt conſiderable on the feveriſh and debilitated.

The ſecretion of the kidnies is encreaſed by its uſe, in a mueh greater degree than eould be expected to ariſe from the water as a ſimple diluent ; the natural action of the cutaneous veſſels is at the ſame time promoted or reſtored, particularly where the inſenſible perſpiration has been obſtructed by febrile conſtriction. Henee, its powers in abating hectic heats and fluſhings, dryneſs of the ſkin and thirſt, are natural and obvious ; and thus its efficaey in preventing or moderating, in hectical patients, the copious colliquative ſweats which neceſſarily ſucceed a previous exacerbation of fever, is eaſily accounted for.

Increaſe of appetite is one of the moſt conſtant effects of this water; which alone, would render it invaluable, in numberleſs caſes of great debility attended with local inflammation, where the ordinary tonics fail, or do harm.

Its effects upon the primæ viæ, may be eaſily conjectured from the analyſis. The quantity of ſaline matter is too inconſiderable to counteract the aſtringent powers of the calcareous earth ſuſpended in it, and coſtiveneſs is not unfrequently occaſioned by its uſe; which, although eaſily obviated, it might in ſome caſes be dangerous to neglect.

I will not pretend to offer any theory of the *modus agendi* of theſe waters in the cure of particular diſorders, ſuch attempts being generally fanciful and fallacious: neither could they be rendered intelligible to the generality of my readers. I ſhall therefore proceed to mention a few of the

DISEASES,

IN WHICH THE

HOTWELL-WATERS

ARE RECOMMENDED.

These waters have been accounted ſerviceable in Scrophulous diſorders, Dyſenteries, and Diarrhœas, long before they had acquired their high reputation in the cure of Conſumption and Diabetes.

In caſes of Atony, Indigeſtion, and Loſs of Appetite, Obſtructions of the Liver, and various diſorders commonly denominated Bilious, brought on by irregular living, abuſe of ſtrong liquors, long reſidence in tropical climates, or other cauſes, theſe waters are daily employed with the beſt effect. Such diſorders are uſually

accompanied with a quick pulſe, and tendency to Hectic Fever; and the ſyſtem, although greatly debilitated, is often ſo irritable as to render the ordinary tonic medicines totally inadmiſſible, much as tonics and reſtoratives may be needed. The avidity with which the Briſtol water is drunk in the Weſt India Iſlands, where the European conſtitution is frequently in the ſtate I have mentioned, is perhaps, more to be aſcribed to its efficacy as a medicine, than its delicacy as a beverage: and I am fully convinced, both from analogy and experience, that Europeans returning from tropical climates in thoſe circumſtances, would derive much more benefit from the uſe of this, than any of thoſe mineral waters, in which iron, or any other active ſtimulant is an ingredient, whatever their reputation may be.

For more than a century, the Hotwell-water has been celebrated as a remedy for Diabetes; which ſeems to have ariſen from the perfect cure of a Baker of Briſtol, of the name of Gugg, in

1680. Diabetes is comparatively a rare diſeaſe, and one of the moſt obſtinate; and the proportion of cures performed by theſe waters, is highly creditable to their efficacy.*

But the diſeaſe for which the Hotwells are chiefly reſorted to, is Pulmonary Conſumption. It is above a hundred years ſince they were firſt brought into notice for the cure of this diſorder; and they have ever ſince continued to riſe in reputation, notwithſtanding the many unfortunate patients who daily reſort to them in vain.

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* It may at firſt ſight appear contradictory, that this water ſhould act both as a Diuretic, and a cure for Diabetes; but it is nevertheleſs natural to expect conſiderable effects in this diſorder, from a remedy that acts ſo decidedly on the kidnies. For although in the healthy and natural ſtate of theſe organs, the urinary ſecretion is increaſed by the uſe of the water, it is not the leſs likely that this ſecretion ſhould be diminiſhed by it in their diſeaſed and unnatural ſtate, where every thing ſeems inverted. Accordingly we find that the moſt efficacious remedies in this diſorder belong to the Diuretic claſs.

and the prejudice and unfavorable inſinuations ariſing from diſappointed hope. Frequent failure is the neceſſary conſequence of the widely extended celebrity of the waters, whereby crouds of invalids in the moſt advanced and deſperate ſtages of conſumption, are attracted to the place as a laſt reſource, when no expectation of a cure can be rationally indulged, from this or any other remedy.

The commencement of the diſorder is often obſcure, and its progreſs in the beginning eaſily overlooked. From careleſſneſs, indolence, or a ſort of fool-hardineſs in the patient, the precious moments in which a cure is practicable are waſted at home, perhaps in a ſituation extremely unfavorable; and the journey to Briſtol is ſeldom ſuggeſted, until it can ſerve no other purpoſe than to amuſe the ſufferings or gratify the impatience of a dying man.

When the patient happens to reſide in the more remote parts of the kingdom, the length

of the journey, and the expence attendant on it, are objects of conſideration; and thoſe only who are in the moſt imminent danger are likely to undertake it. In ſuch caſes, it is reaſonable to expect the event to be unfavorable; but curſory obſervers will attribute to the inefficacy of the waters, what was only the reſult of natural and moral cauſes. Accordingly I am informed, the journey to Briſtol is at preſent, conſidered in the nothern parts of the iſland, as a forlorn hope. The reaſon is obvious. Within the laſt ſeven or eight years it has occurred to me to know of one conſumptive patient, from Scotland, who expired juſt as the carriage which brought him had reached the door of his lodgings; of another, who died the morning after his arrival; of five or ſix who died within the week; and I have heard of ſeveral more, who did not live to reach the end of their journey.

The hiſtories of many, very many caſes from London and other places, are not leſs ſummary;

and many of the ſame deſcription may be ſuppoſed to have eſcaped my obſervation.

Surely no reaſonable man will adduce the event of ſuch caſes as thoſe to the diſcredit of Clifton or its Waters! But it is from ſuch caſes the opinion of unreflecting people is formed on the ſubject. Were the circumſtances fully known to them, they would draw a very different concluſion. Such caſes, where the diſeaſe has advanced ſo near to its termination, are not to be cured by this, nor any remedy hitherto diſcovered: But the utility of a journey to the Hotwells, undertaken while a cure is yet practicable, is demonſtrated by hundreds of examples annually; where the diſeaſe is totally removed or prevented in many, and ſuſpended or mitigated in others.

It is not my intention to inſinuate that all thoſe patients would have recovered, had they been brought to the Hotwells from the very firſt moment of their ſeizure. The fatal

nature of the diſorder will not allow of ſuch preſumption. I only mean to ſet the matter in its true light. Be the Hotwell-waters inert or efficacious, caſes like thoſe, fairly ſtated, can neither attach to them credit nor diſprepute.

Of the TIMES *and* SEASONS *for drinking the Waters, and other circumſtances to be attended to, by Invalids.*

No preparation is neceſſary except an ordinary attention to the ſtate of the body, which may be regulated by the moſt common and ſimple means, and ſhould never be neglected.

The beſt time for drinking the waters, is before breakfaſt, when it can be done with propriety. The ſtate of the weather muſt ſometimes render this difficult and improper in winter; but in ſummer it ought always to be attempted.

Early riſing, of itſelf, is attended with many advantages to Hectical patients. The debilitating morning ſweats are thereby avoided, and the not leſs debilitating effects of ſecond ſleeps and doſing, which are ſenſibly felt even by thoſe in the moſt perfect health. Next to temperance, early riſing is the ſureſt road to health and longevity, as well as to affluence. The victims of a contrary practice are no where more ſadly conſpicuous than in this place. Warmth being a primary conſideration with the conſumptive patient, the time of drinking the water is almoſt entirely reſtricted to the middle of the day in winter; but in mild ſummer weather it ought to be repeated between the hours of five and ſeven in the evening, when it will be found of great efficacy in abating the Hectic Exacerbation, which is at that time more troubleſome than at any other.

The quantity to be drunk at a time muſt depend upon the ſtate of the patient. The glaſſes at the pump-room contain reſpectively,

one half, one third, and one quarter of a pint. It might be well to begin with a couple of the ſmalleſt ſize, interpoſing a ſhort walk or ride between them; but I have frequently known two of the largeſt taken, three, or even four times a day, with ſeeming advantage. It is evidently ſafeſt to begin with a ſmall quantity, which may be increaſed according to its effects.

For many years, the Hotwells have been chiefly reſorted to in ſummer, which is undoubtedly the moſt convenient ſeaſon for drinking the waters, when that is the only object in view; as it can then be done more regularly, and with leſs interruption from the weather. The waters may likewiſe be then more fully ſeconded by the ſalutary exerciſe of riding, over the various downs in the neighbourhood; which, for pictureſque beauty, exceed any thing this country can boaſt of.

But Invalids threatened with Conſumption, ought not to wait the return of ſummer; as the greateſt benefit might be derived from paſſing the winter in a mild atmoſphere, at the commencement of the diſorder, and the greateſt miſchief prevented: for the patient, by remaining in a cold eaſterly expoſure through the winter and ſpring, is not unfrequently rendered incurable, before he reaches Briſtol in ſummer. In our cold and variable climate, the exciting cauſe of Conſumption is moſt commonly a Cold or Catarrh, from the ſharp eaſterly winds which prevail in the ſpring and winter months; a warm ſheltered ſituation during that part of the year, is therefore an object of the greateſt importance to people prediſpoſed to the diſeaſe, or threatened with it; particularly thoſe who reſide on the eaſtern part of the iſland, where theſe winds are much more ſeverely felt. To perſons ſo circumſtanced, a timely change of reſidence would often be the means of entirely preventing the impending diſorder: which leads me to the conſideration

Of the Hotwells as a WINTER RETREAT *for Invalids.*

From the inſpection of its Geographical and Topographical ſituation, no place in England can be ſuppoſed better adapted for this purpoſe, than the Hotwells. Cloſe to a navigable river, within four miles of that extenſive bay of the ſea, called the Briſtol channel, into which the Severn and Avon diſcharge themſelves, and more than a hundred miles from the open and boiſterous ocean, it neceſſarily poſſeſſes all the advantages of a maritime ſituation, without the diſadvantages; the mildneſs of ſea air, with an exemption from ſtorms and tempeſts.

The adjacent country is admirably calculated to render this ſpot warm and ſalubrious. A ridge of high ground in the form of an amphitheatre encompaſſes that part of Clifton called the Hotwells, on the eaſt, north, and weſt, ſheltering it completely from every wind blow-

ing in thoſe directions. The ſouth wind, which alone can reach this ſpot, is neceſſarily mild; and the rays of the meridian ſun, unobſtructed by any intervening height, and reflected by the figure of the back ground, renders its temperature in winter almoſt equal to that of the ſouth of France. Snow ſeldom lies here, and the froſt is never ſevere: indeed I have known the winter paſs without any froſt or ſnow whatſoever.* The ſame obſervations do not altogether apply to that part of the pariſh called Clifton-hill, which being more than 200 feet higher than the Hotwells, muſt be proportionably colder, independant of its expoſure to the north and eaſt winds. From its pure air and fine proſpect,

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This was the caſe in the winter 1789—90. The ſucceeding winter ſome ſnow fell, but none lay on the ground a ſingle day: and the following year produced only ſix or eight days of very moderate froſt. I have more than once had occaſion to obſerve during thoſe years, that the ſnow lay to ſome thickneſs on the ſtreets of Bath (which is only 14 miles eaſtward) and on all the adjacent ground, when not a particle was to be found at the Hotwells.

this is at all ſeaſons an eligible reſidence for thoſe in health; but its elevated and expoſed ſituation, render it extremely improper as a winter retreat, for the Conſumptive invalid. Its advantages in ſummer, are, however, manifeſt and ſtriking. Exceſſive heat is not leſs prejudicial in phthiſical caſes than cold itſelf, particularly in the advanced ſtages of the diſorder; and I have ſometimes obſerved the air of the Hotwells injurioufly warm in hot ſummers. In ſuch caſes, the greateſt benefit is obtained from the clear atmoſphere of Clifton hill, or any hilly country, ſuch as Wales; or ſometimes, from the cool and refreſhing breezes of the ſea ſhore.

Numberleſs ſituations are to be found, which might ſerve as a ſummer reſidence for people in thoſe circumſtances; but I know of none in any way comparable to the Hotwells as a winter retreat: and the adjoining buildings on Clifton hill, are diſpoſed in ſuch a manner, that within the diſtance of a few hundred yards, the beſt

ſituation may be found for every ſeaſon of the year. When to theſe advantages we add the excellent lodgings, the habitual attention in all deſcriptions of people to the accommodation of invalids, the vicinity of the large and opulent City of Briſtol, where the various neceſſaries for the ſick, can be readily procured; when all theſe circumſtances are duly conſidered, I truſt I am warranted in aſſerting that no place in England combines ſo many advantages, independant of the water, nor preſents upon the whole ſuch an eligible winter reſidence for the delicate and conſumptive.*

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* There are ſtill wanting a few improvements, which naturally ſuggeſt themſelves here, and which I ſhall take the liberty of mentioning. 1. A *public Garden,* Clifton being bare of trees, and deſtitute of ſhade in hot weather. The piece of ground adjoining the Mall, ſeems well calculated for the purpoſe; or that part of the common, facing Sion-row. 2. A *commodious ſet of Baths,* ſo eſſential to the cure of many diſeaſes, and ſo much overlooked in this country in general. This might be œconomically eſtabliſhed at Sion-ſpring, as the warm water could be

Notwithſtanding theſe ſuperior advantages, various places on the coaſt of Devonſhire and Cornwall have been of late recommended in preference to the Hotwells, particularly by Phyſicians in the northern parts of the Iſland.

ſupplied from the ſteam engine, almoſt without expence. Here is already one which ſerves alternately as a warm and cold bath. Such a place as Clifton would certainly reward the projector for ſomething of greater elegance. 3. It is to be regretted, there are not under the hill more houſes of a proper ſize for *ſingle families*; moſt of the lodging houſes there being on a large ſcale, ſufficient to accommodate three or four, which neceſſarily renders them noiſy and incommodious, in ſome reſpects, for the ſick. Cornwallis Creſcent appears admirably calculated for the purpoſe, and the houſes, when finiſhed, will poſſeſs every advantage, both in point of ſize and ſituation. 4. All the roads from Clifton to the Wells are *too ſteep*; and often, although perhaps without much reaſon, terrify invalids who have not been accuſtomed to hilly countries. This inconvenience would, in a great meaſure, be obviated by the completion of a road projected and begun ſome years ago, by the back of Prince's Place; which might be done by ſubſcription. 5. A *Bridge over the Avon* would be an immenſe improvement to the country in general, and to the Hotwells as a watering place, by opening to the Invalid, the beautiful and ſheltered roads through the vale of

This preference ſeems to have ariſen from attending ſimply to the latitude of the places, without paying ſufficient regard to local circumſtances. The coaſt alluded to being about a degree farther ſouth than Briſtol, will naturally enough be expected, upon a ſuperficial glance, to be proportionally warmer; but a moment's conſideration muſt ſerve to convince, that latitude alone does not regulate the temperature of places. I have never been able to obtain a complete regiſter of the weather at

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Aſhton, from which they are at preſent morally excluded by an execrable ferry. The Colloſſal bridge ſo often talked of, which was to have connected St. Vincent's rocks, we muſt not expect ever to ſee erected. Yet, what a fine opportunity this, for a man of overgrown fortune to tranſmit his name with honor to poſterity, upon ſuch a majeſtic and uſeful monument of his ſplendor and munificence!

Thoſe who are deſirous of knowing farther particulars of the hiſtory of the Hotwells, and the opinions of Phyſicians on the virtues of its waters, may conſult the treatiſes of Drs. Randolph and Sutherland, or a late publication on the ſubject, by Dr. Nott.

any of the places alluded to : but ſuch accounts of the Barometer, Hygrometer, and even of the Thermometer, as have come to my knowledge, by no means warrant the excluſive reputation they have acquired at a diſtance.

From the maritime, and almoſt inſular ſituation of Cornwall, and its vicinity to the weſtern ocean, we are naturally led to expect a moiſt atmoſphere, frequent fogs, damp houſes, much rain, and boiſterous winds ; and accordingly theſe inconveniences are the general ſubjects of complaint, by the inhabitants as well as ſtrangers. The atmoſphere near the ſea ſhore, particularly in windy weather, is impregnated with ſaline particles to a great degree ; which is generally hurtful to the conſumptive, by irritating the tender lungs, and provoking cough. I am aware there are ſome exceptions to this rule; caſes ſometimes occurring, in which it appears at leaſt to do no harm. Yet I am diſpoſed to believe theſe exceptions to be much fewer than is generally ſuppoſed. There are other diſeaſes,

which, having many ſymptoms in common with conſumption, are often miſtaken for it; yet are, in their nature very different, and to be cured by the moſt oppoſite means: and moſt of the caſes of this ſort of (ſuppoſed) conſumption that have occurred to my obſervation, wherein the ſaline atmoſphere had been beneficial, appeared to be caſes of chloroſis, or meſenteric tabes, attended with hectic, and miſtaken for Phthiſis; but without any actual inflammation of the lungs. Wherever the real Phthifical inflammation exiſted, I have almoſt uniformly obſerved an aggravation of the cough and hectic fever, upon approaching the ſea in windy weather. In ſummer, or in calm weather, when the ſaline atmoſphere is ſcarcely perceptible, this obſervation will not hold good. Much advantage has been derived from a long voyage in a calm ſea, ſuch as the Mediterranean; but the benefit here may be ſuppoſed chiefly to ariſe from the exerciſe of geſtation, and not from ſea air. It is in this place likewiſe proper to obſerve, that the atmoſphere at ſea, except,

perhaps, in a ſtorm, is much leſs impregnated with moiſture and ſaline particles, than that of the ſea coaſt, for very obvious reaſons.

In addition to the objections already mentioned, it behoves the admirers of Devonſhire and Cornwall, to conſider the inferiority of accommodation for Invalids in thoſe places, which is often a more important conſideration than climate itſelf. A damp, uncomfortable apartment, is an evil to ſuch perſons, which no temperature can compenſate.

As water muſt neceſſarily be the principal beverage of Phthifical Invalids, it is worthy of remark, that the water of the wells in moſt of the towns along that coaſt, is more or leſs impregnated with ſalt; which of itſelf is a great inconvenience; and as thoſe towns are generally deſtitute of level ground in their neighbourhood, the patient muſt be in a great meaſure deprived of the ſalutary exerciſe of riding; a loſs which cannot be compenſated in winter by ſailing,

except to thoſe whoſe health and ſtrength are very little impaired.

Many other arguments ſuggeſt themſelves on this ſubject; but I may be thought to have already enlarged much farther than was neceſſary to produce conviction, of the ſuperiority of the Hotwells, as a winter retreat for conſumptive invalids. I ſhall therefore conclude by repeating my admonition to thoſe who deſign to avail themſelves of the aid of the Hotwells, not to await the return of ſummer, but repair to them in winter or autumn; prevention being eaſier than cure. There are few caſes of Phthiſis, unleſs the prediſpoſition to it is unuſually ſtrong, where the diſorder might not be warded off by proper means early applied: but there is no time to be loſt; what to-day appears only a catarrh, or a ſlight irritation of the bronchial tubes, and which might be cured by a ſingle bleeding, may in the courſe of a few winter months, or perhaps a ſingle week, if neglected or ſlimſily treated, have grown

into a confirmed conſumption, beyond the reach of medicine.

Practical Observations

ON THE

PREVENTION AND TREATMENT

OF

PULMONARY CONSUMPTION.

PHTHISIS PULMONALIS or Pulmonary Conſumption, being the diſeaſe for which the Hotwells are chiefly reſorted to, a few obſervations on this formidable and increaſing malady, ſeem intimately connected with the foregoing ſubject. What I have to offer, being principally addreſſed to thoſe readers who have not made phyſic their ſtudy, little will be found in it to intereſt the phyſician, or to gratify the prevalent thirſt for novelty in medicine: The public may however, reap ſome advantage from the following remarks and

cautions; which I ſhall endeavour to render the more eaſily intelligible, by avoiding as much as poſſible, the uſe of technical terms and phyſiological controverſy.

Pulmonary Conſumption is an ulceration of the lungs, of a particular kind, and is known by a combination of moſt of the following ſymptoms: pain in the cheſt, cough, purulent expectoration, with hectic fever.

This diſeaſe is incident to perſons at every time of life; but is ſuppoſed to commence moſt frequently about the age of puberty, particularly in females; who indeed, appear more liable to it at every age than males. The children of Conſumptive or Scrophulous parents are much more frequently its victims than others; particularly thoſe of fair florid complexion, delicate ſmooth ſkin, with large veins, light hair, blue eyes, ſlender make, and narrow cheſt. Conſumption is an epicure as well as a glutton; and it is a humiliating re-

flection that beauty ſhould be often ſo nearly allied to diſeaſe. This diſorder uſually commences with a ſlight cough, at firſt hardly diſtinguiſhable from the ordinary catarrhal cough, commonly dry in the beginning, but ſometimes attended with a mucous expectoration ſtreaked with blood. This is accompanied with pain in ſome part of the cheſt, and ſlight uneaſineſs in breathing, frequent chills and fluſhings, which afterwards come on pretty regularly between the hours of three and ſeven in the evening, and in many caſes, likewiſe about ten in the morning attended with frequent pulſe,* morning ſweats, loſs of ſtrength and fleſh, expectoration of a yellowiſh pus mixed with the mucus

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* This double exacerbation and remiſſion is conſidered as the diſtinctive character of hectic fever. I doubt not the reality of the diſtinction. Perhaps, did not ſome circumſtance, to us unknown, derange the operations of the febrile power, it would be uniformly ſo. But as the matter actually ſtands, the double exacerbation does not regularly take place in one out of three caſes of phthiſis, in any of its ſtages. The exacerbation generally begins from three to ſeven o'clock in the afternoon, and continues,

of the throat and ſaliva, and commonly diarrhœa towards the end of the diſorder. In the beginning the pulſe is frequent and hard during the exacerbations; but during the remiſſions it returns in many caſes to nearly the uſual ſtandard. In the advanced ſtages the pulſations are generally frequent, quick and feeble, and the remiſſions leſs perceptible. The blood when drawn ſhews from the firſt every mark of inflammatory affection, and continues to do ſo to the end. The urine is at firſt high coloured, afterwards turbid, and depoſiting quickly a copious brick-duſt like ſediment: towards the concluſion it

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through its chilly, hot, and ſweating ſtages, until about five or ſix next morning; after which there is a remiſſion until about the ſame hour in the afternoon. Inſtead of a ſingle cold and hot fit ſucceeding each other and laſting a conſiderable time, the hectic exacerbation conſiſts of many chills and flu̇ſhes of ſhort duration, alternating quickly: afterwards warmth or heat becomes more uniform, and at length perſpiration breaks out, often cold and partial. The clean tongue, contrary to what takes place in other fevers, is one of the moſt uniform marks of hectic. The ſediment in the urine may be ſometimes prevented by various medicines.

is ſcanty, owing probably to the copious perſpiration and diarrhœa which generally take place. The tongue from the firſt is but ſlightly furred, and during the progreſs becomes remarkably clean and gloſſy. Thirſt is not very conſiderable, and the appetite is often but little impaired. Expectoration, of a purulent appearance, is generally an early ſymptom, but in ſome caſes it takes place only a ſhort time previous to the fatal cataſtrophe, and long ſubſequent to the hectic fever, emaciation, and other characteriſtic ſymptoms of the diſorder. Varieties of this ſort are naturally to be expected from varieties of conſtitution and accidental circumſtances. Theſe ſymptoms commence for the moſt part in winter or ſpring, and ſometimes diſappear almoſt entirely during the warm weather of ſummer, but return again with the winter's cold; and this alternate intermiſſion and relapſe continue not unfrequently during ſeveral ſucceſſive years.

Such is the hiſtory of Phthiſis in its uſual form: and by a careful attention to the ſymptoms deſcribed, together with ſome particulars to be afterwards mentioned, the diſeaſe may in general be eaſily detected in its very early ſtages.

I ſhall now proceed to conſider the remote or prediſpoſing cauſes of the diſorder, which will at the ſame time comprehend an inquiry into the cauſes of its greater frequency in this than in other countries.

Phthiſis is ſaid to originate either in prediſpoſition, or accidental injuries done to the lungs, or, as frequently happens, in both together. Prediſpoſition ſtrictly ſpeaking may be either hereditary, or acquired during the courſe of a perſon's life from certain conſpiring cauſes, without any original taint. By hereditary prediſpoſition, is meant that ſimilarity in the ſtructure of the lungs, or of the containing parts of the cheſt, to thoſe of the conſumptive parent

which either conſtitutes the (latent) diſeaſe itſelf, or renders the perſon more eaſily affected than others by the ordinary exciting cauſes.* Accordingly it is demonſtrated by Anatomical reſearches, that the lungs of children of con-

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* An objection is made by ſome, to the term *hereditary*, applied to diſeaſes, becauſe they cannot eaſily comprehend how a diſeaſe could be tranſmitted *ſubſtantially* from parent to child in embryo: But it ſurely is not more a matter of ſurpriſe that the child of a conſumptive parent ſhould inherit that *internal* ſimilarity of lungs we have mentioned, giving riſe to the diſorder, than that he ſhould inherit an *external* ſimilarity of ſhape features or colour of hair. We are equally ignorant of the manner in which this is effected, in both caſes. But as the ſuperior proneneſs to the diſeaſe in ſuch perſons is not to be queſtioned, it has been ſuppoſed to proceed from debility alone. That debility frequently *accompanies* this prediſpoſition is certain; but this is not always the caſe: On the contrary the prediſpoſition is ſometimes moſt obvious in perſons otherwiſe remarkably ſtrong and robuſt. *A general debility of conſtitution* therefore cannot be the cauſe of this proneneſs to conſumption in the children of conſumptive parents; and ſuppoſing it to be *a local and ſpecific debility*, it is, nevertheleſs, hereditary; and the term *hereditary prediſpoſition*, appears to me to expreſs the fact better than any other.

ſumptive parents, (as well as thoſe of the parents themſelves), are commonly replete with ſmall callous opake bodies called Tubercles, which in the dormant ſtate, or early ſtages, are ſcarcely the ſize of millet ſeeds, and ſolid; but afterwards enlarge to the ſize of a pea, becoming inflamed, hollow, and filled with a yellowiſh viſcid matter, which at laſt forces its way through its capſule, into the air cells of the lungs and ramifications of the windpipe, and is thus expectorated by coughing. The diſeaſe is then called confirmed conſumption; previouſly, it is termed incipient or threatening conſumption. During the proceſs of enlargement of theſe tubercles, a conſiderable inflammation generally takes place in them, and the parts of the lungs adjacent, occaſioning ſome degree of pain, or ſenſe of heat, with frequent cough, and ſometimes ſpitting of blood from the eroſion of the minute arteries. Whether phthiſical hœmoptyſis, or that ſpitting of blood which is followed by conſumption, takes place only in perſons whoſe lungs were previouſly

affected with tubercles, and proceeds only from the cauſe we have juſt mentioned, is not abſolutely certain; but it is rendered extremely probable from the circumſtance of tubercles being always found in the lungs of perſons who have died of conſumption following hœmoptyſis. It is likewiſe obſervable that when a ſpitting of blood is brought on by accidental violence, in perſons entitled to the tubercular prediſpoſition, it is moſt commonly followed by conſumption; whereas thoſe who are not ſo prediſpoſed generally eſcape unhurt from ſimilar accidents, the ruptured veſſel healing up, as in other parts of the body. I do not mean to inſinuate that the accidental rupture of a blood veſſel in lungs otherwiſe ſound, is incapable of producing the phthifical ulceration. Caſes of this ſort are ſuppoſed to occur; but they are comparatively rare. The ſame obſervation holds good with reſpect to inflammation of the lungs from other cauſes, ſuch as catarrh, meaſles, and pneumonia, or from wounds of that organ by ex-

traneous ſubſtances; the danger of conſumption being always in proportion to the degree of prediſpoſition.

Although the hereditary prediſpoſition is by far the moſt common remote cauſe of the diſorder, it would appear that a prediſpoſition to it may likewiſe be acquired during the courſe of life, by the action of certain cauſes, where there is no reaſon to ſuſpect an hereditary taint. Do theſe cauſes act by producing tubercles in the lungs? This is not directly proved by ſuch perſons falling victims to conſumption; but it is rendered highly probable by the fatal inheritance being likewiſe tranſmitted to their offspring.

Thus we frequently find conſumption commencing its baleful career in families where hereditary prediſpoſition cannot be traced, and continuing through ſeveral generations. It muſt however be acknowledged that conſiderable ambiguity reſts upon this ſubject; for it cannot

be abſolutely demonſtrated that tubercles did not originally exiſt in ſuch families, however improbable it may be in many caſes. Indeed every thing relative to the nature and origin of tubercles is at preſent involved in much obſcurity. By ſome they are ſupppoſed to be of a glandular nature, obſtructed or ſchirrous; and this conjecture, although liable to ſome objections, is not deſtitute of great plauſibility.

Whatever they are, it is ſufficiently probable that they may be produced, or rendered obvious to the ſenſes, by the action of certain cauſes, without any hereditary taint: When once produced in the lungs of a perſon by ſuch cauſes, the children of that perſon will inherit a ſimilar ſtructure of lungs, will inherit tubercles, or at leaſt, a much greater propenſity or proneneſs to the acquirement of them than uſual; for it is not abſolutely determined whether the tubercles are viſible in ſuch children from the time of birth, whether they become ſo ſpontaneouſly, or only in conſequence of the action of exciting cauſes: Tubercles when acted upon to a certain degree

by exciting cauſes, inflame, undergo a kind of ſuppuration, and become conſumptive ulcers: Where the tubercular prediſpoſition is ſtrong, a comparatively ſlight action of the exciting cauſes will be ſufficient to produce conſumption: Where from the habits of a perſon's life, the influence of the prediſpoſing cauſes is ſuperadded to hereditary prediſpoſition, the danger is greateſt: The ſureſt way of eſcaping the diſeaſe, where hereditary prediſpoſition exiſts, is to avoid with care not only the exciting cauſes, but likewiſe thoſe habits of life and other circumſtances, which act as prediſpoſing cauſes. Some of theſe I ſhall now endeavour to point out, being a principal part of the preventative treatment; but the reader will make allowance for the great difficulty as well as uncertainty attendant on ſuch inveſtigations.

The greater frequency of conſumption in this, than in other countries, has been generally aſcribed by authors, to an inſular ſituation, and a cold and variable climate.

That thoſe circumſtances have conſiderable influence on the frequency in queſtion, by acting as almoſt conſtant exciting cauſes, I have not a doubt; but ſtill their influence appears inſufficient to account for the whole effect. For although there are other inſular and maritime countries where the climate is as cold and the weather as variable; yet in none of thoſe do we find conſumption by many degrees ſo frequent. I am therefore inclined to ſuſpect that we muſt principally look into our national habits, and manner of living, for the ſolution of the myſtery.

I believe it is univerſally agreed that in no European nation is the uſe of animal food ſo general through all ranks of people; indeed in no other nation, Holland perhaps excepted, are the lower orders capable of purchaſing it in ſuch abundance; a ſmaller proportion of vegetable matter of courſe enters into the diet of the Engliſh; which is, therefore more nutritious, and, in common language, more heating and

inflammatory, than that of other nations. The natural conſequence of this ſort of diet, is a greater degree of irritability in the muſcular fibre, and a fullneſs of blood beyond the ſtandard of health, rendering them more ſuſceptible of inflammatory affections, and conſtituting what is called an inflammatory diatheſis. The uſe of ſtrong fermented and ſpirituous liquors, is likewiſe more general, which may co-operate with the ſtimulant diet, in occaſioning the inflammatory diatheſis alluded to.

That full diet or ſtrong liquors, are not propitious to health, is in general certain; although ſome particular exceptions may exiſt. I have invariably obſerved the water drinkers, amongſt the higher ranks (I mean thoſe, who from choice, drink no ſtronger liquid) to enjoy the beſt health and the cleareſt intellect; and thoſe nations which are leaſt addicted to the pleaſures of the table, will be found, *cæteris paribus*, the freeſt from diſeaſe. In confirmation of this doctrine I might cite the Hindoos, the moſt temperate,

and the moſt healthy of men. Even the French and Italians are certainly leſs affected with an eternal catalogue of diſeaſes than the Engliſh. They are a hardier and healthier people, through all ranks. Both theſe nations are more abſtemious. I ſpeak of them as they were. In France, drunkenneſs was comparatively rare; in Italy, a perſon in a ſtate of intoxication was, in the ſtreets at leaſt, a very unuſual ſight. Were we to abandon the ſo very general uſe, or rather abuſe of wine and other ſtrong liquors, a very great proportion of diſeaſes, which detract ſo much from the comforts of poliſhed life and affluent circumſtances, would ſpeedily diſappear. Men's ideas are commonly very erroneous with reſpect to the abuſe of ſtrong liquors. That abuſe begins much within the limits of intoxication. In the higher ranks, he who drinks one bottle only, reputes himſelf a ſober man; and he who does not exceed half that quantity daily, is conſidered as remarkably temperate. But although either of theſe allowances may be often perſiſted in for ſome years with ſeeming

impunity, there are few indeed, of thoſe men of iron, whoſe conſtitution will not be undermined at laſt, by this regular and conſtant ſiege. It were better, for young men at leaſt, ſo far as health only is concerned, and abſtractedly from conſiderations of morality, to get drunk once a week, and abſtain entirely the other ſix days, than regularly to indulge in what may be called a moderate allowance, of Port, or Maderia, or other ſtrong wines, every day. In the firſt caſe there would be time for the vinous fever to ſubſide entirely, and for the conſtitution to regain its wonted tone; but in the latter caſe there is no intermiſſion. The ſyſtem is kept continually in a ſtate of unnatural excitement, which hardly any ſtrength of ſtamina is long capable of bearing up againſt. Hence the almoſt uniform concluſion: Gout, Stone, Jaundice, Dropſy, Palſy, Apoplexy, Mania, Conſumption: with the bequeſt of ſuch diſeaſes, together with a general feeblencſs of body and often of mind, to their ill-fated offspring. Theſe are the fatal effects of the Promethean

fire. It is not to be underſtood from hence that wine is not uſeful as a medicine or a cordial, particularly in the decline of life; although the celebrated Cornaro, and many others, have given proofs of its being unneceſſary, even at the moſt advanced age. But however congenial or ſalutary wine may prove to the languid nerves of the aged, it muſt always be pernicious to the young and inflammatory fibre. Were men to drink water only, or ſmall beer, while young and vigorous, the moderate uſe of wine would probably add both to the comfort and duration of that old age, which they by this means might expect to attain.

But the abuſe of wine does not always originate in ſocial intercourſe and youthful folly. In the preſent day, the mother, afraid as it would ſeem, leaſt her darling child ſhould retain any portion of vulgar health, carefully initiates him into the myſteries of Bacchus, from the very cradle; and as ſoon, almoſt, as little maſter is capable of ſwallowing, he is indulged with

his regular allowance of wine. No wonder that Gout, Dropſy, Schirrous Liver, &c. ſhould make ſuch a conſpicuous figure in the hiſtory of his "life and ſufferings." From this early initiation into unnatural and luxurious habits, the native vigor of the beſt ſtamina muſt ſoon be worn out by premature exertion; and if the child is lucky enough to eſcape the violence of accidental colds and eruptive fevers, he will quickly fall a prey to diſeaſes of the Aſthenic claſs, and find himſelf an old man in conſtitution, while he is yet a boy in years.

Children, being endowed with extreme irritability of fibre, are exceedingly prone to inflammatory diſorders upon the application of ſtimulating powers, even of the weakeſt order. In ſuch circumſtances, neither rich food nor ſtrong liquors can, generally ſpeaking, be at all admiſſible; and the effects of the practice become quickly viſible on the children of the rich by the train of inflammatory diſeaſes to which

they are ſubject.* But on the contrary, where faſhion and luxury have not yet baniſhed nature and reaſon from the nurſery, where animal food is ſparingly adminiſtered, and ſtrong liquors not at all, a numerous race of blooming and healthy children grow up into a hardy manhood, which by temperance, may be lengthened out to a chearful old age, exempt from its uſual infirmities. Milk and farinaceous vegetables afford the beſt, and only proper nouriſhment for children under three or four years of age, and they ought to form the principal part of their diet for ſeven or eight years after. But it may be alledged that in caſes where the ſtamina are originally weak, as in children of conſumptive parents, a more generous regimen is indicated in order to ſtrengthen them to the common ſtandard: and accordingly I have known animal

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* On this ſubject ſee Downman's admirable poem, INFANCY; which ought to be carefully ſtudied by every nurſe and every mother.

food and wine prescribed with this view in very early infancy. But if the stamina are weaker than usual, this is the best reason why the small portion of vigor that exists, should not be prematurely worn out by such unnatural stimuli; for surely that is not the kind of food prescribed by nature for this stage of existence. In such circumstances, a proportionably more bland and simple nutriment seems to be indicated. If rich food, in large quantity, could at any period of life impart strength and hardiness, the affluent must always be strong and healthy. The reverse is notoriously true. A certain quantity only, of nutrition is necessary, to supply the waste of strength occasioned by voluntary and involuntary action. The quantity requisite may indeed vary a little according to the degree of exertion, or other circumstances: But the rich seldom stop here, and the superfluous quantity of aliment serves only to generate and nourish disease; and thus, the rich and affluent are brought again upon a level with the poor, when the

balance between ſuffering and enjoyment is fairly ſtruck.

It is not always in the power of a parent to reſtrain young men, when launched into the world, from the abuſe of wine; but they will ſurely be the better able to reſiſt the force of the poiſon, for having been preſerved untainted for twelve or fifteen years.

Againſt this doctrine it may be urged, that young women of good condition, who often eat very ſparingly of animal food, and drink but little wine, are frequently ſtill leſs healthy than their diſſipated brothers. To eſtimate rightly the force of this objection, we ought to take into conſideration, not only the original ſtamina of the perſons, which alone would often afford a ſufficient ſolution of the problem; but alſo the female manner of living, which, notwithſtanding their abſtemiouſneſs, is ſtill more diſtant, if poſſible, from nature's dictates. Without exerciſe, and even labor, the human

body cannot long preſerve its healthy action; but exerciſe and labor can be but ſparingly and inſufficiently employed by a lady, particularly in towns, without a breach of delicacy and decorum. On the contrary, the ſedentary, inactive, formal life, they are morally compelled to lead, the unnatural hours of reſt, the want of mental energy, ariſing from the want of preſſing and invigorating purſuits, and the general reſtraint which the maxims of poliſhed nations neceſſarily impoſe, all tend to cripple and enfeeble their vital powers, and to render them, like flowers raiſed under cover, incapable of contending with the inclemency of the atmoſphere. This is an evil, attendant on riches and civilization, which it appears difficult, and perhaps impoſſible to remedy, ſo great muſt be the change in national manners and habits: But it is in the power of every parent to obviate, in ſome degree, the evils alluded to, ſo far as reſpects his own family.

It would carry me beyond the ſcope and limits of my plan, to enter fully upon the defects of modern ſchool education, ſo far as it reſpects the health of the youth of both ſexes: But I cannot help obſerving, that a conſiderable ſhare of the delicate conſtitution we have been ſpeaking of, is attributable to this cauſe. From almoſt continual motion, ariſes the pleaſure and the health of childhood: How unnatural then, to ſend a child of four years of age to be immured in a ſuffocating ſchool-room, and chained to a bench half the day, merely to be out of harm's way. I have ſeldom seen a boy more advanced in his education at the age of ſeventeen, for having been ſent to ſchool before the age of eight or ten. If during the firſt ten years of life, he has been taught to acquire a ſtrong and hardy conſtitution, it is of infinitely greater conſequence than the few grammar rules that might have been whipt into his reluctant memory.

Cloathing may well be conſidered as an agent in the production, as well as in the cure of diſeaſes; and is therefore deſerving of notice in this place. It is generally remarked by foreigners, that we are much leſs attentive than the people of other nations, in adapting our cloathing to the temperature of the weather, climate, and ſeaſon; a circumſtance for which no good reaſon can be aſſigned. The more frequent viciſſitudes of weather in our iſland, muſt indeed render this obſervance more troubleſome; but it renders it, at the ſame time, more neceſſary. I have been informed, that the Chineſe not only vary their cloathing with the ſeaſon of the year, but alſo with the hour of the day.

The quality of the cloathing muſt likewiſe poſſeſs conſiderable influence on the health. In modern Europe, a preference is univerſally given to linen, as an immediate covering for the ſkin, on account of its ſuperior elegance and cleanlineſs; but in many reſpects it is, perhaps, better adapted to the latitude of Egypt, whence

it originally came, than the cold regions of the North. Although woollen is leſs agreeable to the eye, and perhaps leſs pleaſant to the ſkin, the difficulty with which it ſuffers either cold or heat to paſs, gives it a decided ſuperiority as an article of cloathing, in ſuch a variable climate as ours. From the accounts that have come down to us of the ancients, particularly the Romans, they appear to have been a much healthier and hardier people than the modern Europeans. It muſt be confeſſed it is not now eaſy to aſcertain the general ſtate of health in their towns and villages; but were we to eſtimate it from that of their armies, concerning which our information is more concluſive, we ſhould be induced to believe that diſeaſes, barring accidental viſits of the plague, were much leſs frequent than with us. In the beſt regulated modern armies, almoſt one third periſh in the courſe of a campaign, by diſeaſe and fatigue alone. Amongſt the Romans no ſuch proportion was allotted to this ignoble death. But the Romans wore no linen, and the ſuperior

advantages of woollen ſhirts for thoſe who muſt neceſſarily be expoſed to every change of weather are ſo apparent, that I have been often inclined to attribute a conſiderable ſhare of the ſuperior healthineſs of their ſoldiers, to this article of their cloathing. This opinion ſeems to be confirmed by the experience of thouſands, who of late years, have adopted the practice; and the uſe of flannel next the ſkin, is likely to become again very prevalent. This ſubject is extremely intereſting to ſtateſmen and generals, as well as to individuals.

Not only the materials, but likewiſe the form of dreſs, may poſſeſs conſiderable influence over the health. The grand *deſideratum* in dreſs, is elegance combined with utility; and perhaps all our ideas of the former, are ultimately derived from experience of the latter. Meaſured by this ſtandard, the preſent *coſtume* of the men muſt rank very low indeed; where neither elegance nor fitneſs have any part: an inſtance of the triumph of capricious and exotic faſhion, over

the laws of taſte, and the dictates of nature. But abſtractedly from ideas of taſte, every thing tight in dreſs, by compreſſing the parts and cramping motion, is injurious to health. I have more than once obſerved a temporary ſpitting of blood excited by wearing the waiſtcoat too narrow, or by buttoning the coat over the cheſt. But the injury to the female ſex from the uſe of long and ſtrait ſtays *was* much more ſerious and extenſive. The miſchievous effects of this abſurd and unnatural faſhion on the tender frames of young women, could only be equalled by its own innate deformity; and it is to be hoped, that long waiſts will never again disfigure the perſons of our fair country women. The looſe Grecian dreſs of the preſent day is not leſs conducive to health than to elegance; and although it is not long ſince the waiſt has eſcaped from bondage, a ſenſible improvement in health and beauty, will, I doubt not, ſoon be apparent.

While engaged in conſidering the influence

of dreſs on the health, I am led to notice the practice at preſent very general amongſt Ladies, of *occaſionally* covering the throat with a cravat, while perhaps, a conſiderable part of the cheſt is left expoſed to the inclemency of the weather. The ſubject may appear trivial to ſome; but as this *inverted* cuſtom is not leſs injurious to health than detractive to beauty, I deem it not unworthy of diſapprobation.

I have thus endeavoured to point out the moſt conſiderable remote cauſes of this diſorder, together with thoſe circumſtances in our national manners and habits which moſt obviouſly contribute to produce that tenderneſs and irritability of conſtitution, which renders the inhabitants of this country more liable to diſeaſe in general, and to conſumption in particular, than the neighbouring nations.* But the diſorder is never

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* Various other circumſtances which I have not enumerated, have likewiſe been ſuppoſed to contribute thereto: ſuch as the very general uſe of Tea during the preſent century; open chimneys, and fires of pit coal; even the

ſuppoſed to ariſe ſpontaneouſly; being always traced by the patient to ſome accidental injury, while the prediſpoſition is frequently overlooked. The circumſtances which are thus immediately inſtrumental in rouſing the diſeaſe into action, are denominated *exciting cauſes*.

Theſe are injuries done to the lungs, by extraneous ſubſtances, by falls, bruiſes, and violent exerciſe, ſuperinducing inflammation or hœmoptyſis, various eruptive diſorders, Pneumonia, Catarrh, &c. The operation of moſt of theſe agents in the production of conſumption, is too apparent to require any comment. Pneumonic inflammation is of two kinds, as it affects the ſubſtance of the lungs or the inveſting membranes, and thence called Peripneumony or Pleuriſy. The former terminates either in

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encreaſed ſize, cleanlineſs, and comfort of modern houſes and apartments, by affording a more plentiful ſupply of pure air, has been ſuppoſed to render the lungs more ſuſceptible of the conſumptive inflammation.

reſolution, in death, or in ſuppuration of the ordinary kind. This ſort of pulmonary abſceſs is always followed by hectic fever and cough, but not always by conſumption. For the matter of the abſceſs ſometimes burſts into the cavity of the cheſt, whence it may be either abſorbed or evacuated by a ſurgical operation: at other times it finds its way into the bronchial tubes, and unleſs ſuffocation inſtantly enſue, it may be expectorated, and the patient recover: not unfrequently, however, particularly where the phthiſical prediſpoſition exiſts, it terminates with all the uſual ſymptoms of conſumption.

The terminations of pleuriſy are nearly the ſame with thoſe of peripneumony, and indeed the two varieties of the diſorder are uſually combined: but where the pleura happens to be principally affected, inſtead of reſolution or abſceſs, an effuſion of water into the cavity of the cheſt ſometimes takes place; or adheſions are formed between the two contiguous ſurfaces

of the pleura, giving riſe to cough, dyſpnœa, and frequently conſumptive ulceration, with its uſual ſymptoms.

There is likewiſe a ſpecies of inflammation of the pleura, ariſing without any evident cauſe, which differs from pleuriſy in not being attended with violent pain, fever and dyſpnœa, and ſeems to have the ſame relation to that diſorder which chronic rheumatiſm has to the acute. In conſequence of this, adheſions frequently take place, which ſometimes loſe by degrees their inflammatory tendency, and remain for many years without occaſioning much inconvenience; except perhaps a tranſient pain upon any uncommon exertion, with ſome dry cough and dyſpnœa upon expoſure to cold. At other times, however, the adheſions are followed by ulcerations ſpreading through the ſubſtance of the lungs, and producing all the uſual phenomena of phthiſis. In other caſes, the adheſions between the two ſurfaces are not ſo complete as to render them perfectly continuous, but

ſome tender filamentous granulations are formed, connecting the membranes looſely together. Theſe are probably ſtretched and injured by the motion of reſpiration, or efforts in coughing, whereby a ſerous fluid oozes out continually into the cavity of thorax, the accumulation of which conſtitutes dropſy of the cheſt.*

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* I remember to have ſeen a caſe of this ſort which was ſaid to commence with the uſual ſymptoms of incipient Phthiſis, nor was the real nature of the diſorder for a long time ſuſpected by ſome very able and experienced Phyſicians. After death, the cavity of the cheſt was found to be filled with water, the lungs being compreſſed into the ſize of a man's fiſt; but they were eaſily inflated to the natural ſize, and were perfectly ſound in every part, except about the breadth of half a crown of the poſterior edge of the left lobe cloſe to the ſpine, where the pleura is reflected upon the ribs: the injury, however, was no deeper than the ſurface. About a dozen ſpungy filamentous granulations, or faſciculi of granulations, of a red colour, and about the thickneſs of a ſmall crow quill, were obſerved attached to both ſurfaces of the pleura, and which had been lengthened by the ſhrinking of the lungs, to half an inch. The colorleſs lymph was ſeen oozing out upon the ſlighteſt preſſure. Such a diſeaſe muſt probably be always fatal, unleſs the inflammation cauſing the granulations could be ſtopped at the commencement: but as caſes of this ſort, although rare, may ſometimes occur and embarraſs the practitioner, I thought the above not unworthy of mention.

Hepatitis, or inflammation of the liver, is ſometimes ſaid to prove the exciting cauſe of Phthiſis; and caſes are upon record, where an abſceſs in the liver made its way through the diaphragm into the lungs, and where bile was actually expectorated by coughing.

Calculous concretions are ſometimes expectorated in conſumptive caſes, and are ſuppoſed to act as the exciting cauſe; they may, however, be only the ſymptom of another diſorder, Gout, accidentally aſſociated with the pulmonary conſumption.

But by far the moſt frequent exciting cauſe of this diſorder is Catarrh, which being of itſelf moſt commonly attended with cough and inflammatory fever, is very often confounded with Incipient Phthiſis. The importance of diſtinguiſhing one of the moſt harmleſs, from one of the moſt fatal diſeaſes, is ſufficiently obvious; and the ſubject has long exerciſed the ingenuity of Phyſicians. The matter ex-

pectorated being in both cases subject to considerable variation in colour and consistence, no accurate judgment can be formed of the disease from its appearance; attempts have therefore been made to analyse the mucus of the Catarrhal, and the pus of the Phthifical cough, with a view of establishing a chemical diagnosis: But although I have repeatedly performed the experiments of Darwin and Broogman on this subject, the result was always too capricious to be confided in; that is to say, it was influenced by circumstances which I possessed not the means of explaining. It should, however, be recollected, that the purulent matter of a phthifical ulcer, must always be more or less mixed with the mucus of the trachea and saliva, in the act of expectoration; from whence the result, were the process in itself ever so decisive, must necessarily be liable to fallacy. The common test of pus sinking in water is for similar reasons fallacious; inspissated mucus being heavier, and purulent matter when mixed with air bubbles lighter, than water; and

hitherto we have no certain criterion for diſtinguiſhing the one from the other: but the experienced phyſician will always be able from concurring circumſtances, to form a pretty accurate conjecture.

There is ſtill another very frequent cauſe of Phthiſis which I had almoſt omitted, and which is deſerving of particular notice. About the age of fourteen or fifteen, girls of weak ſtamina and ſedentary habits, are frequently affected with a train of ſymptoms peculiar to the abſence of a certain change which ought about that time to take place in their conſtitution: ſuch as pallid countenance, indigeſtion, depraved appetite, coſtiveneſs, head-ach, lowneſs of ſpirits, langour, debility, difficulty of breathing upon ſlight motion, pain in the cheſt, cough, hyſteria, &c. conſtituting chloroſis. From theſe ſymptoms, together with the abſence of a certain natural evacuation, the diſorder is preſumed to ariſe from poverty or ſcantineſs of blood. Accordingly nutritious food, and ſtimulant

medicines, particularly chalybeates, are ſuppoſed to be indicated, and liberally adminiſtered. The conſequence is, that if the girl is ſo much *too young in conſtitution* that the intention cannot be accompliſhed on the firſt eſſay, the dangerous ſymptoms of cough, pain in the cheſt, and difficult reſpiration, inſtead of being removed, become aggravated more and more; fever ſupervenes with hœmoptyſis and inflammation of the lungs, and confirmed conſumption is not unfrequently the conſequence of an injudicious and obſtinate perſeverance in this ſtimulating deobſtruent plan.

I have obſerved with concern the great proportion of conſumptive caſes in females of a tender age, which may be clearly traced to this origin, the abuſe of tonics and chalybeates. It is a too frequent practice of anxious and impatient mothers, to ply their daughters with chalybeates upon any accidental irregularity about this time of life, from a miſtaken notion that ſome dreadful malady, probably conſumption,

muſt enſue, unleſs this irregularity is inſtantly removed: without ſuſpecting that in this they often miſtake effect for cauſe, and that their precipitation is the moſt likely means of inducing the very diſorder they wiſh to obviate. I have even known mothers ſo confident in *their* own ſuperior ſagacity in this particular, as to controul, or endeavour to controul the medical attendant, whatever might be the riſque. The powers and utility of tonics and chalybeates in certain caſes of this nature, are well known to every phyſician and to every quack; but their promiſcuous and empirical exhibition is always hazardous, and often miſchievous, and cannot be too ſeverely reprehended.

Moſt caſes of chloroſis, whether proceeding from *emanſio* or *ſuppreſſio menſium*, are attended with a plethoric ſtate of the whole ſyſtem inſtead of a ſcarcity of blood. Blood-letting therefore, is commonly the ſafeſt and moſt effectual emmenagogue, which often removes the diſorder at once, and always alleviates the urgent ſymp-

toms, cough, pain and ſtricture of the cheſt; thereby allowing time for the natural efforts and operations of the conſtitution. This, with the occaſional exhibition of an emetic, and the frequent or conſtant uſe of an aloetic laxative, pediluvium, warm bathing, warm cloathing, fleſh bruſh, exerciſe on horſeback, moderate diet, with time and patience, will always remove the diſorder with perfect ſafety. Iron, when the plethora and fever have ſubſided, may in many caſes be exhibited with advantage; likewiſe opiates and cold bathing, under certain circumſtances, and with proper diſcrimination.*

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*I have not enumerated Contagion as a cauſe of Phthiſis, no caſe having ever occurred to me, where it could be poſitively traced; and it has always appeared to me more eaſy and natural, to account for the ſuppoſed caſes of infection upon other principles. Where ſeveral perſons of a family become affected with the diſorder, one after another, it is in general only a proof of a common hereditary prediſpoſition; and even where huſband and wife ſucceſſively fall victims to the diſeaſe, before a proof of infection can be eſtabliſhed, it will be neceſſary to take into the account the great frequency of prediſpoſition to the diſeaſe

I have been thus particular in conſidering the cauſes of conſumption, in order that the preventative treatment might be the more clearly underſtood: what I have farther to offer on the ſubject may be compriſed in a few words. By an early and perſevering attention to the rules and cautions enumerated, the diſeaſe will not only in general be warded off, even where hereditary prediſpoſition is ſtrongly marked, but the conſtitution greatly improved. Where the body has already attained its full growth, and an original tenderneſs of conſtitution and proneneſs to conſumption, is confirmed and rivetted by long habit, the taſk of regeneration

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in this country, together with the hurtful effects of fatigue, watching and confinement, which a perſon in ſuch circumſtances uſually undergoes, and which might have been equally injurious, and equally productive of conſumption in this perſon, had the former relative died of dropſy or any other lingering diſtemper. But the ſtrongeſt negative proof is afforded by the nurſes at the Hotwells, who, were the diſeaſe infectious, could not poſſibly eſcape; whereas I never knew any one of them affected with it.

muſt be proportionably more difficult and uncertain; but in early infancy the proſpect is fair and flattering. The venerable Cullen was wont to declare that he never met with a caſe of rickets where *cold bathing* had been employed from early infancy, a practice not uncommon in Scotland; and as its effects are ſcarcely leſs obvious as a preventative of ſcrophula, and other diſeaſes of weak and irritable ſolids, there is reaſon to expect, that by due perſeveranee, in that practiee from the cradle, togcther with ſuitable regimen and exereiſe, as above pointed out, moſt of the evils of bad ſtamina might in a great meaſure be obviated, and the prediſpoſition to conſumption eradicated. But as theſe injunctions cannot always be complied with, nor aecidental injuries eluded, the aid of medieine will ſometimes be neceſſary.

The perſons moſt liable to the diſorder have been already deſeribed: to ſuch perſons the ſymptoms of Incipient Phthiſis, eough, pain in the cheſt, or ſpitting of blood, are alway*

deſerving of ſerious attention. A cold, although ſlight in its attack, muſt never by them be neglected. If it does not in the courſe of a day or two give way to abſtinence from animal food and ſtrong liquors; if it comes to be attended with fever, tightneſs acroſs the cheſt, and cough; if it appears to affect the lungs rather than the head, an adequate quantity of blood ſhould be immediately taken from the arm, and meaſures adopted for procuring a copious perſpiration, ſuch as an antimonial emetic at bed-time, with ſome warm diluent beverage through the night. If the ſtricture and pain of the cheſt ſhould not yield to the firſt bleeding it ought to be repeated according to the neceſſity, and a bliſter applied on the affected part. By this practice the patient will in all probability be perfectly relieved from the complaint in the courſe of a ſingle night.

It may however be alledged by the careleſs or the timid, that it cannot be neceſſary to undergo ſo many torments at once, for what

after all is probably nothing more than a common cold. But ſurely no perſon in ſuch circumſtances, who is not totally inſenſible to danger, will think it a light matter to be freed, in a ſingle night, from the imminent riſque of an incurable diſeaſe, be the diſcipline ever ſo ſevere. Beſides, it is not always eaſy to diſtinguiſh the phthifical from the catarrhal cough, and a miſtake might be, and often is, fatal. Luckily the treatment in both caſes is nearly the ſame, differing only in degree and neceſſity. Phthiſis as well as Catarrh being attended with an inflammatory diatheſis of the ſyſtem, every part of the antiphlogiſtic regimen is clearly indicated in the incipient ſtage; comprehending a total abſtinence from animal food and ſpirituous and fermented liquors of every ſort. The diet ſhould conſiſt of milk, fruits, eſculent herbs, and farinacea. The drink, water, milk and water, ſeltzer water, Briſtol water, imperial, &c. In caſes where a ſmall quantity of animal food begins to be allowable, a portion of ſmall beer, ſpruce beer, and ſuch like liquors,

abounding with carbonic acid, might be indulged in preferably to others.

When either from the inveterate nature of the diſorder, or from having been ſo long neglected, the ſymptoms are not removed by the evacuant and antiphlogiſtic treatment, the bleeding ought to be repeated, either by the lancet, or by leeches, or cupping glaſſes applied as near as poſſible to the affected parts.

A bliſter kept open, or an iſſue or ſeton near the ſeat of the pain or ſtricture, will be found of the greateſt efficacy in removing them. When the pain ariſes from an inflammation of the pleura only, theſe remedies will ſeldom fail to effect a cure, and even when the ſubſtance of the lungs is affected, great relief is conſtantly obtained from them. As it frequently happens when a bliſter has been kept open for a length of time upon a ſpot affected with pain, the inflammation is thereby removed to ſome other part of the cheſt, in ſuch caſes it will be neceſ-

ſary to change the ſite of the bliſter according to the ſhifting of the pain or ſtricture.

Internal remedies may be likewiſe employed with advantage in preventing or moderating the fever, and quieting the cough; ſuch as neutral ſalts, antimonials, and ſometimes opiates. Riding on horſeback has been univerſally recommended in this and indeed in every ſtage of this diſorder; and undoubtedly, gentle exerciſe in fine weather cannot fail, in moſt caſes, to have a good effect on the general health: but in the preſent caſe it ought to be very gentle indeed, or altogether avoided, as every thing which accelerates the motion of the blood cannot fail to be injurious. The utility of warm cloathing is obvious; and woollen ought to be immediately ſubſtituted for linen next the ſkin. Where the circumſtances of the patient will permit, a journey or voyoge to a warmer climate, particularly for the winter ſeaſon is much to be inculcated; where that cannot be complied with, the moſt ſheltered

and eligible ſituation in England ſhould be reſorted to for winter quarters; and where neither of theſe can be accompliſhed, the greateſt attention poſſible muſt be paid to the preſervation of the body from cold and ſudden chills, by means of warm cloathing, and avoiding expoſure to night air, and damp and windy weather.

By an early and ſufficient attention to theſe obſervations, I am perſuaded that nine-tenths or a greater proportion of the caſes of threatening conſumption might be warded off, and the conſtitution though naturally delicate, be made to endure the uſual term of life.* But ſince, either through neglect, or in ſpite of every precaution, the conſumptive ulceration is not always prevented, it will be proper to lay before

* It is highly probable that the lives of elderly people, who are very frequently affected with a ſort of habitual catarrh, might be prolonged by reſiding in a warm climate, ſuch as Spain, Italy, or the Indies.

the reader, a ſummary of the moſt approved methods of cure or of palliation.

Where ulceration has once taken place, the diſeaſe frequently runs its courſe, as formerly deſcribed, in a few months; but at other times it is protracted for ſeveral years and even to old age. This ſeems to ariſe from the indolent and circumſcribed ſtate of the ulcer, from the ſmaller degree of irritability in the conſtitution, and the leſs violence of the fever. To bring about this indolent ſtate of the diſorder when ulceration actually ſubſiſts, is an indication of the greateſt importance; and affords the beſt proſpect of curing the complaint as well as of prolonging life. This is chiefly to be accompliſhed by a ſteady perſeverance in the plan formerly laid down for the prevention of ulceration, which continues ſtill equally neceſſary as long as the inflammatory ſymptoms ſubſiſt with violence.

In the more early ſtages of the confirmed as well as in the incipient conſumption, our greateſt

dependance continues to reſt upon the antiphlogiſtic regimen, bliſters, ſetons, and particularly the lancet; whether with a view of palliating ſymptoms, or of ſuſpending the progreſs of the diſorder. It will however, be frequently objected to bleeding in this ſtage of the complaint, that the debility is already great, and it might be thereby encreaſed.

But this objection is founded rather on ſuppoſition than actual obſervation. For wherever the debility is occaſioned by inflammatory fever, as in this caſe, bloodletting by leſſening that fever, will invariably be found to leſſen the debility; and in ſuch circumſtances the patient would be weakened more by a ſingle night's fever, than the loſs of many ounces of blood.*

* The reader will remark, that I have recommended the uſe of the lancet more freely, in the different ſtages of this diſorder, than the general practice of the preſent day ſeems to countenance. I do ſo, not from any preconceived theory of the diſorder, although it appears perfectly conſiſtent with theory, but from actual obſervation of its

Conſumption may no doubt have arrived at that period when no relief could poſſibly be derived from bloodletting nor low living, and where on the contrary life may be prolonged and ſymptoms mitigated by a free indulgence in animal food, and wine, or even ſtronger ſtimulants. Theſe inſtances of temporary benefit, frequently

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ſuperior utility. I entered on the practice of phyſic with prepoſſeſſions of an oppoſite tendency.

In this country, bloodletting, not only in Phthiſis but in moſt other diſeaſes, has of late years fallen into a general diſcredit, which it is not eaſy perhaps to account for. I am inclined to ſuſpect that when philoſophy came to be applied to phyſic, and the theories of the old phyſicians were diſcovered to be founded on falſe principles, their practical obſervations were too frequently diſcarded along with them, without ſufficient conſideration. It ought to have been remembered that art in general precedes ſcience, and that the practice of the ancients might in ſome reſpects have been good, although their dogmas were fallacious. I will not pretend to inſinuate that bloodletting and the antiphlogiſtic regimen may not have been carried much too far in many caſes, within the preſent century; but certain it is, for ſome years paſt, the oppoſite ſyſtem has been carried to an equally hurtful exceſs. So apt is man, in the purſuit of knowledge, to run from one extreme to another.

induce the patient or his relatives to arraign the ſkill of the phyſician, and to infer that the diſeaſe might have been cured had this practice been adopted ſooner: It appears indeed probable, that caſes of this ſort have been ſufficient, for the young and the ſanguine amongſt medical men, to build a theory upon; and we have occaſionally ſeen pork broth, myrrh, ſteel, wine, and other ſtimulants, recommended by authors in the cure of conſumption in all its ſtages.

I will not detain the reader with a deſcription of the various palliative remedies adapted to the relief of each particular ſymptom that may ariſe in the progreſs of this diſorder, the application of which muſt be regulated by circumſtances peculiar to the caſe and the conſtitution of the patient; but ſhall content myſelf with exhibiting a general view of the different means employed with a curative intention. Theſe may be referred to three claſſes.

1. Remedies which act on the ſyſtem in general: comprehending diet, bloodletting, emetics, tonics, exerciſe of geſtation.

2. Remedies which act or are intended to act chiefly on the diſeaſed lungs through the medium of the circulating fluids: ſuch as mercury, lead, copper, arſenic, barytes, and other ſubſtances of the mineral kingdom, acids, reſinous ſubſtances, cicuta.

3. Remedies which act on the lungs directly through the medium of the atmoſphere: ſuch as, the ſteam of water inhaled, with or without impregnation from various volatile matter, exhalations of tar or turpentine, vapor of æther with or without cicuta, and ſimilar ſubſtances; vapor of vinegar or other acids, carbonic acid gas or fixed air, and various other factitious airs, breath of cows, various powders of vegetable or mineral ſubſtances diffuſed in air and reſpired.

Upon each of theſe different heads, regimen and bloodletting excepted which have been already ſufficiently noticed, it will be proper to beſtow a moment's conſideration.

Emetics have been greatly recommended by authors in this ſtage of the diſorder, and caſes are upon record where a radical cure was ſuppoſed to have been obtained by their long continued daily uſe. The trials which I have made of emetics in confirmed conſumption, have not been attended with the ſame ſucceſs as in the incipient; indeed I never found the ſtrength ſufficient in confirmed phthiſis to ſupport their action when repeated with a view to a radical cure. With Digitalis I have not been more fortunate: but I have often perceived beneficial effects form the occaſional uſe of any of the emetic remedies.

Conſumption being ſuppoſed by ſome phyſicians to ariſe from debility alone, various tonics, ſuch as, iron, Peruvian bark and other bitters

have been recommended, together with the moſt nutritious animal food and wine. That a great degree of debility always accompanies this diſeaſe is unqueſtionable, and in the latter ſtages where it is moſt conſiderable, or where the ſyſtem poſſeſſes a ſmaller degree of irritability than common, tonics are ſometimes of temporary ſervice. But when we recollect that the debility is only the effect of local inflammation, we cannot expect it to be permanently relieved by tonics: and indeed when the diſeaſe appears in its uſual form, I have conſtantly obſerved tonics of every ſort to aggravate the fever, render the cough more troubleſome, the expectoration more difficult, the pain in the cheſt and dyſpnœa more conſiderable. So irritable is the ſyſtem rendered by this diſeaſe, that I have ſometimes obſerved all theſe inconveniences to ariſe from the weakeſt ſtomachic bitter, ſuch as a cup of weak chamomile tea; and a caſe has rarely occurred to me, where tonics in any form were at all admiſſible, except, as was formerly remarked, in the very laſt ſtages of the

diſorder, and even there they are not always ſerviceable.

Exerciſe of geſtation, whether on horſeback, in a carriage, or on water, is univerſally found to quiet the cough* and allay the fever; and it is aſſerted that confirmed phthiſis in a very advanced ſtage, has been perfectly cured by geſtation duly perſevered in. Two remarkable caſes of this ſort uſed to be related by Dr. Cullen; one cured by a continued journey of ſeveral months through various parts of England, and the other by a voyage of ſeveral years round the ſhores of the Mediterranean. In both caſes the greateſt debility had taken place: the former could not at the beginning travel more than five or ſix miles a day. Sea voyages have long been celebrated in the cure of phthiſis,

* Analagous to this is the well known effect of riding in preventing fits of the whooping-cough for ſeveral hours, while the patient continues on horſeback.

and I believe with great juſtice; but it ought to be obſerved that as many very great inconveniencies are to be encountered at ſea, the voyage ſhould be undertaken early: For I have generally underſtood, when it was delayed until the patient had become very weak, the benefit was greatly overbalanced by the injury, particularly when cold and ſtormy weather happened to enſue.

Of the remedies which act upon the diſeaſed lungs through the medium of the circulation, none appears more likely at firſt ſight, to prove beneficial in phthiſis, than mercury, from its well known powers and ſubtilty, particularly if we ſuppoſe it to be a glandular diſeaſe; but experience has not confirmed this expectation, and except where the pulmonary affection ariſes from one particular cauſe, mercury has not been found ſalutary.

It is doubtful whether the other metallic ſubſtances enumerated under the ſecond head enter

the circulating fluids, moſt of them appearing to act on the alimentary canal alone, and perhaps chiefly as emetics. In the trials I have ſeen made with thoſe ſubſtances, little benefit ſeemed to be derived from any except lead. It is difficult to conceive how this noxious mineral could enter the circulation without violent effects; yet its decided power in ſtopping pulmonary hœmorrhage and abating inflammation of the lungs, render it probable that it acts through the medium of the fluids rather than the nervous ſyſtem. Although lead is not a new remedy for conſumption, the violent effects which it ſometimes produces on the bowels have deterred many practitioners from uſing it. Much care is undoubtedly neceſſary in its adminiſtration, and great miſchief may be done by a remedy of ſuch powers in the hands of the unwary. The doſe ſhould be ſmall at firſt, as its effects are not equally ſenſible on different perſons, and it ought to be deſiſted from the moment that any unpleaſant ſenſation in the bowels take place. For the greater ſafety it

ſhould not be continued more than a week or ten days at a time. The moſt convenient form of the medicine is a ſolution of the acetated lead in diſtilled water. In caſes of great urgency, I have ſometimes adminiſtered it in the doſe of four grains every ſix hours; but in ordinary caſes of hœmoptyſis or inflammation, a ſmaller doſe is more adviſcable, as it can be longer perſiſted in, for example, half a grain, or a grain three or four times a day. I have ſometimes perceived an evident effect in hœmoptyſis, from a ſingle grain, nor have I hitherto met with any unpleaſant accident from its uſe; and although it is certainly attended with ſome danger, I know of no remedy ſo well deſerving of attention in the cure of this moſt dangerous diſorder.

I have mentioned Barytes under this head, although I have made with it only a few ineffectual trials: the noted effects of the muriated barytes on bad ulcers, and its uſefulneſs in ſcrofulous caſes, afford however, a preſumption in its favor.

Conſiderable temporary benefit is often obtained from the pretty liberal uſe of acids. They are in general grateful to the ſtomach, and are found to abate heat and thirſt, and ſometimes to ſuſpend or mitigate fever. Their effects ſeem to be chiefly reſtricted to the *primæ viæ*, and diarrhœa is frequently occaſioned or aggravated by them ſo as to render their farther exhibition inadmiſſible. I have ſeldom obſerved the vitriolic acid to exert any aſtringent power neither over hœmorrhagy nor colliquative perſpirations: on the contrary, it ſometimes ſeems to aggravate both. I have lately given the nitrous acid in pretty large doſes with a view to a radical cure, but have not found it to differ materially in its effects from the vitriolic.

The exhibition of turpentines and balſams in this diſorder, was probably ſuggeſted by their external digeſtive properties, being frequently employed in ancient ſurgery for cleanſing old foul callous ulcers: and phthiſis being accounted a foul callous ulcer of the lungs, the attempt

was made of applying to it this digeſtive, through the medium of the circulating fluids. Although few ſubſtances poſſeſs more acrimony, it is highly probable the Terebinthinates enter the circulation largely, from their great diuretic powers, and the odor they impart to the urine, and even to the cutaneous perſpiration; it is, therefore, not unlikely they may poſſeſs the power of acting on the lungs directly, as local ſtimulants, independant of their general ſtimulant properties.

In Italy, theſe remedies have long been celebrated in the cure of phthiſis, and an electuary conſiſting chiefly of turpentine, with a ſmall proportion of wax and oil, colored with red ſanders, and known by the name of Locatelli's balſam, from its inventor, has been received into the ſhops and pharmacopeias in moſt parts of Europe. But whatever might be its ſucceſs in the warm climate of Italy, where the nerves are unſtrung by the heat, and the fibres leſs rigid and leſs diſpoſed to inflammation, and

where, of courſe, nervous debility muſt be proportionally great; its uſe, after the experience of a century, has been almoſt abandoned in the northern parts of Europe, where its high ſtimulant powers are found incompatible with that ſtrong tendency to inflammation, which always accompanies the phthiſical affections of thoſe latitudes. I have likewiſe had opportunities of obſerving its exhibition at Naples, where it is a common enough remedy amongſt the natives, in all caſes of cough and hoarſeneſs; but in caſes of real conſumption, it did not appear more ſalutary than in this country. The terebinthinate remedies happened about that time to have proved injurious to ſome Engliſh phthiſical invalids to whom they were adminiſtered, cauſing inflammation and fatal hæmorrhagy, for which the phyſician endeavoured to account from the rigidity of the Engliſh fibre. This might poſſibly be true in ſome degree, but I was more diſpoſed to account for his favourable opinion of the medicine, from the unfrequency of real conſumption among the natives. Slight

catarrhal affections, and ſome other diſeaſes which may be eaſily miſtaken for incipient phthiſis, would in moſt caſes be cured independent of any medicine, and even in ſpite of bad treatment. The only caſes of conſumption where I ever obſerved the terebinthinates in any way ſerviceable or even innocent, were a very few, in which, the inflammatory ſymptoms were from the beginning uncommonly mild, or had given place to extreme debility, and where the expectoration and colliquative ſweats and diarrhœa were extremely great. But wherever the cough is hard and dry, the pulſe quick and ſtrong, the heat and thirſt conſiderable, with pain in the cheſt, and difficult reſpiration, theſe medicines are totally inadmiſſible, and the greateſt miſchief is frequently done by their empirical exhibition. So great is their inflammatory tendency, that dangerous hœmorrhagy is often brought on by their uſe in the early ſtages of the diſorder: and at the more advanced periods, and where recovery is out of the queſtion, the ſtrength is ſo ſpeedily

exhauſted, that I have ſeen patients in this way cut off in the ſpace of two or three weeks, who would in all probability have ſurvived many months, had no ſuch internal cautery been applied.

The tranſient reputation of theſe medicines in the cure of phthiſis, has ariſen from the accidental cure of another complaint which may be very eaſily, and often is miſtaken for incipient conſumption, by the unſkilful or inattentive. The diſeaſe I allude to is chloroſis, which has been formerly deſcribed; and as it poſſeſſes many ſymptoms in common with phthiſis, it is not to be wondered at that it ſhould be miſtaken by the ignorant, or miſrepreſented by the crafty, however diſtinct the diagnoſis may be to the profeſſional obſerver. It will not be diſputed that chloroſis not unfrequently terminates in conſumption when the prediſpoſition is ſtrong, or the treatment injudicious; nothing however can be in its nature more different. In certain circumſtances of

chloroſis, as was formerly obſerved, turpentines, chalybeates and tonics of various ſorts, are extremely efficacious, the diſeaſe ſometimes yielding to them readily; if therefore, this complaint has been accounted conſumptive, the remedies will of courſe be credited, however unjuſtly, for the cure of this formidable diſorder. It ought however to be remarked, that the beneficial effects of theſe medicines have been almoſt entirely reſtricted to the female ſex, a circumſtance which ſtrongly corroborates the foregoing opinions. To conclude, as theſe ſubſtances are poſſeſſed of great powers, they are well deſerving of attention from the enlightened practitioner; but for the ſame reaſon they muſt ever be in the hands of ignorance and raſhneſs, moſt dangerous weapons.

Cicuta was at one time much recommended in this diſeaſe, but its celebrity ſeems at preſent on the decline. As a narcotic I have ſometimes found it ſerviceable in palliating ſymptoms; but it is extremely uncertain in its doſe and

operation. The total failure of cicuta in the cure of cancer, although uſhered into the world with the moſt reſpectable atteſtations, ſhould ſerve as a warning againſt implicit faith in new remedies, how great ſoever may be their reputation.

The remedies of the third claſs have the obvious advantage of being applied directly to the affected part, ſo far reſembling ſurgical applications. From the well known relaxing property of warm water, and the ſalutary effects of ſteam in reſolving inflammatory affections of the throat, there is a preſumption in its favor in caſes of pulmonic inflammation. Accordingly where the cough is hard and dry and apt to recur in paroxyſms, inſtant relief is often obtained from the inhalation of aqueous vapors; but I cannot bear teſtimony to its efficacy as a radical cure, having never heard of its being perſevered in ſufficiently for that purpoſe, nor indeed with that intention. But in ſome caſe it is an uſeful palliative, and is always eaſi

procured by breathing through the ſtroop of a tea-pot into which a few table ſpoonfuls of boiling water has been poured; but Mudge's inhaler, which may be procured at a trifling expence, is a much more convenient inſtrument. The mucilaginous or aromatic herbs, ſometimes recommended to be infuſed in the water, appear to be of little importance.

There are ſome caſes on record in which the exhalations of tar or turpentine were found of ſervice in cough ſuppoſed to be conſumptive: but the *accuracy* of the obſervers, not being profeſſional men, cannot eſcape ſuſpicion, although the fulleſt credit is due to their veracity. Theſe cures are ſaid to have taken place from breathing the atmoſphere of tar warehouſes in America, or that of manufactories for boiling and refining tar or turpentine in this country. The practice muſt be attended with conſiderable trouble in either caſe; but certainly the warm moiſt air of ſuch boiling houſes may fairly be preſumed to poſſeſs a powerful influence on

the lungs, independant of any impregnation from the tar ; although no medical practitioner has taken the trouble of inveſtigating the ſubject.

The vapor of vitriolic æther inhaled, has ſometimes the power of inſtantly ſtopping a fit of coughing, and relieving dyſpnœa ; but in all the caſes where I have ſeen it employed, theſe effects were but temporary, and it ſoon loſt the power of affording even temporary relief. In many inſtances (perhaps the greateſt number) wherein it was perſeveringly uſed, hoarſeneſs was produced by it and a degree of ſore throat. In ſome caſes, this inflammatory affection ſeemed to extend from the fauces into the lungs, creating or aggravating cough, dyſpnœa pain and ſtricture to an alarming degree, in one caſe rendering copious bleeding neceſſary. The effects of æther medicated with opium, cicuta, hyoſcyamus, &c. are not ſenſibly different, ſo far as I have obſerved or been informed.

In this way the vapors of vinegar might be inhaled, and of other acids, were they preſumed to be ſalutary; but all of them, with the exception of the carbonic acid gas, appear too ſtimulant and irritating to the lungs, to be uſeful or admiſſible in this complaint. But previouſly to the farther conſideration of this and other factitious airs, it may be neceſſary to ſay a few words on the compoſition of the atmoſpheric air.

By the diſcoveries of Prieſtley and Lavoiſier, atmoſpheric air has been aſcertained to be a compound of two different ſorts of airs or gaſſes, viz. oxygen, or vital air, and nitrogene, azote, or phlogiſticated air; in the proportion of 27 of the former to 73 of the latter, in the hundred parts of atmoſpheric air. In ſome places, one part or two, in the hundred, is found to be carbonic acid gas. Of theſe, the oxygene alone, contributes to ſuſtain life or flame; the others, which conſtitute nearly three-fourths of the whole, being uſeleſs or noxious in the un-

mixed ſtate. But it is found that oxygene, pure and undiluted, is too ſtimulant for the ordinary purpoſes of reſpiration, tending to produce an inflammatory diſpoſition of the whole ſyſtem: and it has been ſuppoſed that even the common proportion of oxygene in the atmoſphere, may, in certain conditions of the lungs, for example in phthiſis, poſſeſs a degree of ſtimulating power, unfavorable to health. It has, therefore, been propoſed, in ſuch caſes, to ſuperadd a quantity of ſome *unreſpirable** air, with a view of ſimply diminiſhing the proportion, and of courſe the ſtimulus of the oxygenous part. It is, however, highly probable, that each of theſe gaſſes is endowed with a ſpecific power of action on the living body, independent of the mere ſubtraction of ſtimulus; although hitherto little more ſeems to be aſcertained on the ſub-

* *Azotic air* is a better term, but it might have been confounded with that particular ſpecies of azotic air called *azote*, by the French Chemiſts.

ject, but that all of them, with the exception of oxygene, have the property of diminiſhing the action of the heart; from which it is reaſonable to infer, they diminiſh the irritability of the nerves, and the tendency to inflammation.

The factitious airs which have been chiefly employed in the cure of conſumption, are the carbonic acid gas, the carbonic inflammable gas or hydro-carbonate, and the hydrogene gas; oxygene gas, for the reaſons formerly mentioned, being thought inadmiſſible in this diſeaſe.

It is many years ſince the carbonic acid gas was obſerved to poſſeſs ſalutary powers, when applied to ulcers externally; in conſequence of which, it was recommended by Dr. Prieſtley I believe, to be inhaled, as a direct application to phthifical ulcers. In ſome caſes of this ſort, it has been found uſeful in lowering the pulſe, relieving dyſpnœa, and correcting the fetor of the expectorated matter; but ſometimes, on

the contrary, it is obſerved to encreaſe the cough and dyſpnœa: this, however, may be owing to ſomething extraneous mixed with the gas.

The ſedative powers of carbonic acid, as was formerly ſtated, ſeem to proceed, not from the ſimple ſubtraction of ſtimulus, by leſſening the quantity of vital air reſpired in a given time; but from ſome inherent ſedative property of the gas itſelf. Upon this ſuppoſition, the ſedative effect will be according to the encreaſe of the carbonic gas in a given bulk of air, and not according to the diminution of the oxygene gas. But as carbonic gas, (being deſtructive to life), could not be adminiſtered unmixed, the greateſt poſſible effect would be obtained, by mixing with this gas, as ſmall a portion of pure vital air as could ſerve to ſuſtain animation, whereby the inert azotic gas would be totally excluded, and a proportionably larger quantity of carbonic gas ſubſtituted in its room. In this way it may

be reſpired in very large proportion with ſafety and advantage.

The methods of procuring it are various. The moſt common, is from a mixture of chalk and vitriolic acid: but it is to be ſuſpected, that in this way ſome of that acid ariſes with the gas. It is obtained in large quantity from burning charcoal, or limeſtone calcined in cloſe veſſels, which laſt is, perhaps, the pureſt of any; and it is not improbable, that the gaſſes obtained by theſe various methods, differ eſſentially in ſome of their properties and effects. The air of wine-cellars and malt-houſes is ſtrongly impregnated with this gas, which is extricated from the fermenting vegetable matter, and has been, as well as the air ariſing from limekilns, immemorially celebrated in diſeaſes of the cheſt, among the labouring people. But I have never obſerved any cure of phthiſis, nor any very laſting benefit from this remedy, in any form.

The heavy inflammable gas obtained from charcoal, to which the ingenious and ſcientific Mr. Watt has given the name of hydro-carbonate, is poſſeſſed of very great powers on the animal œconomy. When reſpired, it generally cauſes vertigo, with a diminution of the frequency of the pulſe, although very largely diluted with atmoſpheric air. It is likewiſe found to redden the fleſh of animals, and to render it more tender. From its ſedative properties, it has been conſidered well adapted to phthiſical complaints, and conſiderable benefit is ſaid to have been derived from it.*

Of the efficacy or utility of this, and other remedies of the ſame claſs in conſumption, my

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* The general properties of this and the other gaſſes, together with the method of preparing them, are very clearly and fully explained by Mr. Watt in the printed deſcription of his Pneumatic apparatus. In the annexed reports by Dr. Beddoes may be ſeen the effects of theſe gaſſes in the cure of diſeaſes ſo far as they are yet aſcertained.

own experience has been too limited to juſtify me in delivering an opinion. In the few caſes where I had an opportunity of adminiſtering them, or of obſerving their effects, they proved unſucceſsful. But theſe were caſes of the moſt unfavourable kind; being generally ſuch as afforded no room for expectation of recovery by the ordinary treatment. It will, no doubt, be alledged, that ſuch caſes are fair, and the only fair caſes for the experiment; becauſe where the patient is likely to do well by the uſual method of cure, or by the efforts of nature alone, the recovery cannot be conſidered as a proof of the efficacy of a new remedy.

There is, however, much reaſon to fear that no eſſential nor general advantage in phthiſis can be obtained from the factitious airs, in the partial and inefficient manner they are at preſent adminiſtered in, be their virtues what they may. The portion of the day is comparatively ſmall in which they can be uſed, and there are many patients who cannot be made to inſpire through

a tube without a painful and hurtful effort, for which the mouth pieces that have been invented, afford but an imperfect remedy. Theſe inconveniences, indeed, might be obviated in a great meaſure, by fitting up a ſmall cloſet in any dwelling houſe, for the purpoſe, in which the patient might ſit at his eaſe, read, and amuſe himſelf in various ways, for hours at a time, breathing without any effort, the factitious air, which could be ſupplied from time to time, or conſtantly, if neceſſary. This could be accompliſhed at a very ſmall expence, as common paper varniſhed, or ſlips of oiled ſilk or linen would ſerve to render the walls and crevices almoſt impervious to air, and the door might eaſily be ſo ſhaped and armed with leather, as to become ſufficiently air-tight.*

* Some time ago I had a portable apparatus conſtructed upon theſe principles, in the form of a ſedan chair, which I have found to anſwer the purpoſe extremely well.

But beſides theſe obſtacles, it is often difficult in private practice to procure the gaſſes, and the neceſſary apparatus and materials are attended with conſiderable expence to individuals. This evil can only be obviated by the Apothecaries in general adopting the practice of preparing the gaſſes in common with other remedies, which could be eaſily done, with the apparatus above referred to, by any one poſſeſſed of the moſt moderate chemical knowledge, or the ſmalleſt turn for mechaniſm or experiment. This would likewiſe prove the moſt effectual means of diveſting pneumatic medicine of that air of myſtery or ſingularity, which tends ſo much to prevent it from coming into general uſe, or at leaſt, from obtaining a full and fair trial.* Every lover of experimental

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* Another advantage to the healing art would likewiſe reſult from this practice, as it would neceſſarily tend to accuſtom Apothecaries to Chemical ſtudies and manipulations, which, it is to be regretted, are at preſent too much neglected by that branch of the profeſſion, where the

inquiry muſt be anxious to ſee the Pneumatic inſtitution projected by Dr. Beddoes, carried into effect; whereby the powers of theſe remedies would be aſcertained more fully and accurately than could otherwiſe be done. The inevitable expence of ſuch an eſtabliſhment muſt tend, I am afraid, to retard its execution. In the mean time, it appears to me, that the purpoſe might be effected in a great meaſure, in any hoſpital or infirmary, at a very moderate charge; as no additional expence, except that of the pneumatic remedies, and the fitting up of a couple of rooms, which could not be great, would be incurred; houſe room, medical attendance, and other neceſſaries, being already found.

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original province and duties of preparing and diſpenſing the medicines ſeems to be in a great meaſure forgotten, or exchanged for the more hazardous and reſponſible office of preſcribing them, which, evidently demands an education entirely different in kind.

The ingenious Dr. Darwin has deſcribed a very ſimple and eaſy method of diffuſing in the atmoſpheric air, certain ſubſtances, ſuch as Bark in powder, white lead, &c. which by inhalation might be applied directly to the diſeaſed lungs. None of the modern improvements in the cure of phthiſis appear more plauſible than this; and although I know but of few caſes where it has been employed, and only one where it was attended with much advantage, the nature of the remedy juſtifies a ſtrong preſumption in its favor. It is natural to entertain doubts of the innocence of ſome of theſe ſubſtances received into the lungs, ſuch as Ceruſe, but I have not heard of any inſtance where *Colica Pictonum*, or any other bad conſequence followed the experiment. Some coughing, at firſt, will naturally be expected.*

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* The lungs in the ſound ſtate at leaſt, do not appear to be ſo ſenſible to many ſtimuli as is generally ſuppoſed. I remember in 1787, when employed at Edinburgh with ſome inveſtigations and experiments on the nature and cauſe of Aſthma, to have injected ſeveral ounces of water into the

The breath of ruminating animals, particularly Cows, has been immemorially accounted ſalutary in diſorders of the cheſt: but the prac-

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lungs of a dog through an opening in the trachea; but inſtead of ſuffocation which I expected to enſue, no apparent inconvenience to the animal aroſe from it, except ſome convulſive efforts of coughing, for a few ſeconds while the water was in the act of deſcending; and next day when the lungs were inſpected, the water was entirely abſorbed or evaporated. The experiment was repeated on another dog with water in which ſome powder of Ipecacuanha was diffuſed, with hardly any other effect. Next day he was perfectly well. Several drachms of quickſilver were injected inio the lungs of another dog, which occaſioned the ſame convulſive efforts while deſcending, which however did not laſt more than a few ſeconds, and the animal continued to breathe in the ordinary way without the ſmalleſt cough, and ate his food as uſual. When killed twenty-four hours after, the ſubſtance of the lungs were rendered blue in the interior parts by the mercury, moſt of which had by ſome means been ſo minutely divided as to loſe entirely its metallic luſtre, and had inſinuated itſelf into the veſſels or air cells to a conſiderable extent. Had the dog been ſuffered to live, it would have been curious to obſerve the farther effects of the mercury; but my inveſtigations extended at that time to the irritability of the lungs only, and it is not juſtifiable to multiply theſe cruel experiments without ſome very definite purpoſe.

tice had fallen into diſuſe (at leaſt with medical men), until of late, that ſome trials have been made with it again, both on the continent and in this country. The ſucceſs attending theſe trials, ſo far as I have been informed, has not been equal to expectation. The experiment, however, is harmleſs.

Such are the uſual remedies, and principal modern improvements in the treatment of Conſumption. The foregoing account of them, although very imperfect, will, I hope, enable the reader to form ſome idea of their reſpective efficacy, and thereby tend to remove the too great partiality or prejudice which often exiſts in favor of ſome remedies, againſt others, to the no ſmall embarraſſment of the phyſician, and detriment of the patient.

It is a ſubject of much regret, that we have not yet attained the knowledge of any certain cure for this hitherto fatal diſorder: But it is

ſincerely to be wiſhed that the ſpirit of inveſtigation which characteriſes the phyſicians of the preſent day, may not ſlacken on a ſubject ſo intereſting to mankind. May it meet with that applauſe which it juſtly deſerves, and may its exertions at length be crowned with ſucceſs!

END.